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THEME

Study and design model of smart home

Presented by :

- Allal soltane eddine
- Othmani abderrahim
- Ghendir akram
- Melik ilies

Supervisor:

✍ Dr. LAOUAMER Mosbah

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DEDICATION

In this honorable place, with a simple gesture traced in writing, but which springs from the deep feeling of gratitude, allow us to quote the names as a memorandum for those who have a special place:

To our dear fathers To our dear mothers

To our brothers and sisters

To all our cousins without exception To all our family.

To all our friends without exception

To all; we dedicate this theme, which is the meaning of my higher studies, as a Gift from the Heart, praying ALLAH Almighty to put it at the service of our nation and the good of humanity, and that it will be a light on our journey professional

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Abbreviation

3D: Three dimensions

BDD: Database

Access C.: Access control

Cauff.: Heating

Conf.: Comfort

CSC: Client service center

Domut.: Home automation

Lighting: Lighting

EDGE: Enhanced Data Rates for GSM Evolution

GSM: Global System for Mobile communications

IDE: Integrated development environment

IOT: Internet of things

LED: Light-Emitting Diode

M2M: Machine to Machine

Motor : Motorization

ABSTRACT

This study takes place on the realization of a smart home with a remote-control system under Android application and an Arduino board.

The goal of the project is to create an ideal home with high efficiency in terms of ease and precision of smart phone control, which helps the user to reduce costs and effort, taking into account the principle of comfort and safety.
***Keywords*:** home automation. Smart home. Sensors. Arduino. M2M

RESUME

Cette étude se déroule sur la réalisation d'une maison intelligente avec un système de télécommande sous application Android et une carte Arduino.

L'objectif du projet est de créer une maison idéale avec une grande efficacité en termes de facilité et de précision du contrôle du Smartphone, ce qui aide l'utilisateur à réduire les coûts et les efforts, en tenant compte du principe de confort et de sécurité.
Mots clés : domotique. Maison intelligente. Capteurs. Arduino. M2M

ملخص:

تجري هذه الدراسة حول تحقيق منزل ذكي مع نظام تحكم عن بعد تحت تطبيق Android ولوحة.Arduino

الهدف من المشروع هو إنشاء منزل مثالي بكفاءة عالية من حيث سهولة ودقة التحكم في الهاتف الذكي ، مما يساعد المستخدم على تقليل التكاليف والجهد ، مع مراعاة مبدأ الراحة والسلامة.
الكلمات المفتاحية :

أتمتة المنزل. المنزل الذكي. أجهزة الاستشعار. أردوينو. M2M .

General Introduction

General Introduction:

The habitat is a place of great importance for everything and for everyone, of its nature it is the place where one stays and returns. All individuals, and especially the elderly, spend much of their time at home, hence the considerable influence of the home on the quality and nature of life. Improving the feeling of comfort and security in the home therefore appears to be quite important from a social point of view.

Not long ago, computing was applied to the creation of smart homes in order to improve people's living conditions when they are at home and offer them reliable remote control. Such a house is a residence equipped with ambient computer technologies aimed at assisting the inhabitant in the various situations of domestic life.The so-called smart homes increase the comfort of the inhabitant through natural interfaces to control the lighting, the temperature or the various electronic devices.

Another essential purpose of the application of information technologies to habitats is the protection of individuals. This has become possible through systems capable of anticipating and predicting potentially dangerous situations or reacting to events endangering the inhabitant. The beneficiaries of such innovations can be autonomous individuals but also more or less fragile people with a limited capacity for movement, still a facilitator for many people with disabilities Where applications allow today the blind and visually impaired to gain autonomy in their movements and allow them to control several components without difficulty. Smart systems are able to remind residents, among other things, to take their medication, facilitate their communication with the outside world or even alert relatives or emergency services.

Steps

The main Steps of this works are:

- ✓ Studying available literature review of smart home.
- ✓ Simplify and facilitate control of home systems.
- ✓ Connecting the home control panel to the smart phone.
- ✓ Installation of sensors to keep the house and gear safe.

Memory Outline

Chapter 1 presents a literature review of smart home. Where, the smart home are outlined, a brief historic of smart home is exposed and so the status home automation

Chapter 2 This chapter presents the basic elements to realize this project, the hardware consisting of sensors used to convert physical quantities into quantities of different properties, usually electrical. There is also an Arduino board to control the system under investigation. Finally, the software consists of applications such as the IDE responsible for programming our system, Fritzing and Remote XY for our additional circuits.

Chapter 3 In this chapter, a full study will be conducted on the mechanism of smart home design and control by smart phones, and all this is based on the analysis of the project idea in detail in this chapter.

CHAPTER I

A literature reviews

of smart home

I.1.Introduction:

The idea of creating an automated house was born at the end of the 19th century: this is to say that its history is long! Indeed, as early as 1803, they imagined a house where there would be electricity in all the rooms: it would be enough to press a switch to turn on the light.

But this ideal home is constantly evolving: Today, it is a home that is not only automated that we want but also smart! This house has been represented for many years in literature or in science fiction films.

For many years' researchers and engineers have been ensuring that this house becomes a reality.

I.2.Historical Evolution:

The word home automation was included in the dictionary "lepetit Larousse" in 1988. The word "home automation" consists of two words: "doums" (Latin for home) and "tics" (a technology that combines computer science and telecommunications).

The beginnings of building technology are often associated with the 1970s or even the 1980s, when energy problems caused by the oil crisis had a significant impact on the construction and operation of buildings. In fact, prior to these crises, energy costs were negligible compared to the material and labor costs associated with habitat construction and operation. **[1]**

Forced insulation was preferred in new buildings when energy prices rose significantly. However, managing an existing fleet was costly and problematic. This is how the first automated control solutions or well known as Technical Building Management (GLT). Based on the means of communication between the PLC (boiler, ventilation, … etc) and the sensor, these solutions make it possible to optimize the energy balance of the building according to the needs of the presence of residents, natural inputs, outside air temperature.

Although these solutions are expensive, they were gradually rejected in the mid-1990s and proposed to habitats. In that case, the functionality was the same as proposed for the larger building. Control of heating, ventilation, air conditioning (HVAC), lighting, openings (shutters and blinds). Second, it provided residents with a promise of functional comfort, primarily through centralization of control devices, such as the ability to close all shutters on the façade and control the heating room on a room-by-room basis. In parallel, an intrusion detection solution was launched that developed the "security" segment using the same technological foundation. These solutions may interact with home automation systems. For example, close the shutter when the alarm is activated, or activate the light when the occupant is absent to simulate presence.

I.3.Definition:

I.3.1.Home automation:

Home automation is the set of techniques of electronics, building physics, automation, computer science and telecommunications used in buildings, more or less "interoperable" and allowing to centralize the control of the different systems and subsystems of the house and the company (heating, roller shutters, garage door, entrance gate, electrical outlets, … etc).

Home automation aims to provide technical solutions to meet the needs of comfort (energy management, optimization of lighting and heating), security (alarm) and communication (remote controls, visual or sound signals, … etc) that can be found in homes, hotels, public places, … etc.

I.4.Principles of home automation:

Home automation, everyone talks about it without really knowing what it is. Just consult the manufacturers' catalogs to be easily convinced. Dictionaries are full of definitions all more or less similar. The encyclopedic dictionary Hachette, 1995 edition, tells us that home automation is the computer applied to all systems of security and regulation of domestic tasks intended to facilitate daily life "Vast program! Where the electricity stops, where the automatisms stop.**[2]**

Where does home automation start?

If fifteen years ago, it was enough for an electrician to carry out all the electrical installation of a building, it is quite different today.

The skills required are multiple – electronics, automation, safety, thermal, energy – because all domestic equipment is closely coupled.

All this equipment is connected to each other by specialized wired or wireless links.

We can summarize by saying that home automation is the technological field that deals with the automation of the home, hence the etymology of the name that corresponds to the contraction of the term’s "house" (in Latin "domus") and "automatic". It consists of setting up networks connecting different types of equipment (household appliances, Wi-Fi, Bluetooth, home automation equipment, …etc) in the house.

I.5.Smart home:

Smart House or Home Automation: The term Smart House is becoming more and more no longer used. It has two definitions. It may simply be the English translation of the home automation. Others give it an extra range, the housing becomes smart, by against the word "home automation" is therefore a recent word of the French language and it is actually the sum.

the words "doums" which means domicile in Latin and the suffix "tick" attached to the technical word. To define as clearly as possible Smart House or Home Automation is the logical evolution of a home with many connectivity.

It seems that this is a powerful concept putting into action all the techniques and electronic, computer and telecommunications technologies to automate and to optimize tasks within a home without any human intervention, used in buildings, more or less "interoperable" and allowing to centralize the control of the different systems and subsystems of the house (heating, garage door, entrance gate, sockets electrical, … etc).

The Smart House aims to provide technical solutions to meet the needs for comfort (energy management, optimization of lighting and heating), safety(alarm) and communication (remote controls, visual or audible signals, … etc) that one can be found in homes, hotels, public places, … etc.

FigureI.1: The benefits of a Smart Home

I.5.1.The principle of operation of a smart home

The principle of operation of a smart home is to centralize the control-command. Unlike a conventional electrical installation, the control and power circuits are separated. This makes it possible to establish links between the control devices and the order receivers, which usually belong to independent subsystem.

In 2009, the first home automation boxes appeared on the market. Unlike previous wired solutions that are often very expensive, home automation boxes use the power of the Internet and wireless. With or without subscription, they allow open use and are controllable from a computer, Smartphone or tablet. The installation is very simple, and is done in a few minutes by an inexperienced user.

I.6.Ambient intelligence:

Due to technological advances and miniaturization, computers are no longer targeted solely at end users. Computing also takes the environment into account, thanks to information from sensors that can communicate with each other. The environment is very diverse, including homes, cars, offices, and conference rooms. Prior to the development of the concept of ambient intelligence, the term ubiquitous computing was proposed by Weiser in the Xerox PARC project in 1988 to refer to a model of human-computer interaction.

Information processing about daily activities has been integrated into the object.

The vision of ubiquitous computing has been made possible by the deployment of many miniaturizations, low power, high durability, and connected devices since it was installed in places where people perform their daily activities.

In the literature, there is great confusion regarding the use of ambient intelligence. They are often used indiscriminately. Yet, we consider more relevant the distinction proposed by Augusto which states that the concept of ambient intelligence covers a wider field than the mere ubiquitous availability of resources and that it requires the application of artificial intelligence to achieve its goal, namely to behave judiciously and show initiative. Thus, unlike the other two concepts.

Ambient intelligence calls for contributions from other fields such as machine learning, multi-agent systems or robotics.

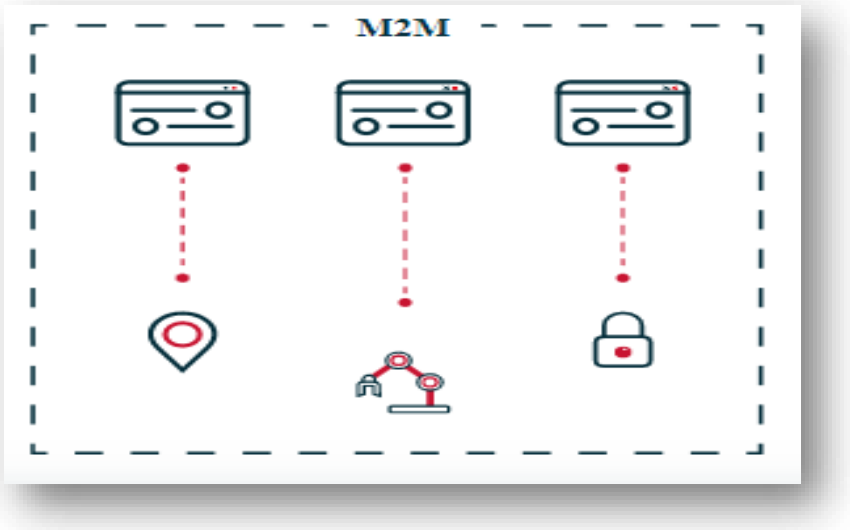
I.7. Communication object:

I.7.1. M2M (Machine to Machine):

M2Mincludes a solution that allows machines to communicate with each other or with a central server without human intervention. It is a recently booming market driven by favorable technological and economic dynamics, and its evolution depends on the sector of activity. But we can already identify the most promising health and safety.

Of course, at the level of home automation, we can observe the same rise in these communication objects. Objects of everyday life are equipped with communication solutions, like a cauldron. home appliances, … etc.

If the main functions of yesterday's home appliances do not change, this "networking" will increase the capacity by 10 times. However, we are also observing many special objects that have recently appeared. **[3]**



FigureI.2: machine to machine (M2M)

I.7.2. IOT (Internet of thinks):

Definition of the Internet of Things: According to the International Telecommunications Union, the Internet of Things (IOT) is "advanced by connecting objects (physical or virtual) through existing or new interoperable information and communication technologies. It is a global infrastructure of the information society that provides various services.

In reality, the definition of what the Internet of Things is not fixed. Cut the conceptual and technical aspects. From a conceptual point of view, the Internet of Things characterizes connected physical objects with their own digital IDs that can communicate with each other. Others This network forms a kind of bridge between the physical world and the virtual world. From a technical point of view, the IOT consists of direct and standardized digital IDs (IP addresses, SMTP protocols, http) of physical objects via wireless communication systems such as RFID, Bluetooth, or Wi-Fi chips. **[4]**

FigureI.3:Internet of thinks (IOT)

I.7.2.1. Operation of IOT:

The IOT enables networking of various intelligent objects over the Internet. therefore, Its operation requires several technical systems. "IOT is Various technology solutions that make it possible (RFID, TCP / IP, mobile technology, … etc).

Can identify objects and collect, store, process, and send data in physical form Not only in the environment, but also between the contexts of the physical and virtual universes. " As a matter of fact, several techniques are used to manipulate Idol, but here we will focus only on them. **[5]**

Some of what Han and Chang Han say are important techniques in Idol. this The technologies are RFID, WSN.

• RFID: The term RFID includes all technologies that automatically use radio waves.

Identify an object or person. It’s a technology that makes it possible.

Information can be stored and retrieved remotely thanks to tags that send out wirelessly wave. This is a way to transfer or identify data from a tag to an object.

An object from a distance. The label contains electronically stored information z

Read remotely.

• WSN: A group of nodes that communicate wirelessly and have nodes organized.

Cooperative network. Each node has processing power and can include:

Different types of memory, RF transceivers and power supplies are also possible.

Consider different sensors and actuators. As the name implies WSN represents a network of wireless sensors. This could be a technology

Required for IOT functions.

I.8.Home Automation Technologies:

I.8.1.X10

X10 is a machine-to-machine communication system which was developed in 1975 by Pico Electronics Ltd. in Glenore's, Scotland and was the first communication protocol used for home appliances.

Since wireless technologies were not as advanced as they are today, it was designed to use power line wiring in order to send signals to devices at home.

X10 uses a power line wiring system to send radio frequency signals in order to send basic digital information to devices. Digital data is encoded onto a 120 kHz carrier, which is transmitted in bursts. TheX10 wireless protocol has also been developed and is used nowadays.**[6]**

I.8.2.Insteon

Insteon is a home automation technology used to define another protocol for machine-to-machine communication between home appliances. Insteon uses both wired and wireless power lines in order to carry messages to other devices in a home, just like X10 but with different encoding and frequencies. Insteon messages can carry up to 14 bytes of data at a time.

I.8.3.EnOcean

The Endogean technology is mainly used in home automation but is also being used in other areas. It only transmits wireless messages to control devices.

Endogean's wireless data packets are 14 bytes long, like Insteon, and are transmitted at 125 Kbps. The transmission frequencies used for the devices are 902 MHz, 928.35 MHz, 868.3 MHz, and 315 MHz

I.8.4.Z-Wave

Z-Wave is one of the technologies we will try in order to build the examples in the following sections using Intel Galileo.

The Z-Wave protocol is an interoperable wireless RF-based communication

technology designed specifically for controlling, monitoring, and reading the status of devices designed for home use.

Z-Wave is a low-powered RF wireless technology that operates in the sub-1 GHz band.

The lower layers, MAC and physical are described by the ITU-T G.9959 specification. It is fully backwards compatible. The Z-Wave radio uses 868.40 MHz, 869.85 MHz (Europe, South Africa, UAE, Singapore, China), 869.00 MHz (Russia), 868.10 MHz (Malaysia), 908.42 MHz (the United States), 910 MHz (Israel), 919.82 MHz (Hong Kong), 921.42 MHz(Australian/New Zealand) and 865.2 MHz (India).

There are over 1,000 interoperable products available, that is, 12million Z-Wave products worldwide, which is one of the reasons why we have picked Z-Wave to create examples. For more information,

I.8.5.ZigBee

ZigBee is also our focus. More products are being launched with ZigBee technology, such as the popular Philips Hue bulbs and many other devices by large manufacturers.

ZigBee is a wireless communication protocol used to create personal area networks built from small, low-power digital radios. ZigBee uses2.4 GHz radio frequencies and is based on an IEEE 802.15standard.

It consumes little power, has a relatively nice line of sight and transmits data over 10–100 meters depending on the power output and environmental characteristics. ZigBee has a defined rate of 250 Kbps.

I.9. Home Automation Software:

There are many home automation devices that use different things Technology on the market. To connect to the house Automated device, you need a compatible controller to use Same log. Some manufacturers only offer private APIs Connect to the hub to access your device.

The open source community supports several technologies. She developing software libraries for using USB and serial controllers Connect and manage existing devices. You can automate your home Use a PC using an open source project. Some of the software projects used in the project The following sections are described in the next section. You can navigate your home to your project. **[6]**

I.9.1. Linux MCE.

Linux Media Center Edition (LinuxMCe) is free open source.

Main focus of Linux distribution LinuxMCe in the media center is on design a distribution that allows personal video recorder theater PC, Home Automation, Lighting, Air Condition System, Monitoring and Security Systems and VoIP Phone Systems Support for video conferencing system on Linux.

LinuxMCE supports many home automation technologies As mentioned in the previous section; you can manage the lighting Home remote socket using LinuxMCE..

I.9.2. Open Remote

Open Remote is a cross-platform software framework that makes it possible. Many home automation protocols can be used, etc.

Technology for automation of commercial buildings. Open Remote Supports ZWave, Instanton, X10 and many other useful protocols use scripts to automate developers. Cross-platform software Supports Linux, Windows, Mac and other systems.

I.9.3. Open wave.

OpenWave is an open source software library that can be used. Using the Wave PC Controller Selected to develop Home Automation Using a wave device. It provides useful abstraction layers developer, You do not need independent knowledge of wave Log or purchase the Wave Development Kit.

I.9.4. Other Software Projects

The following is another software project:

-OpenHAB: This is developed with Java and is hardware And the seller is unstable. The goal is developers can easily interact with vendor technology

On all platforms.

-Open Source Automation: This project is open source software running on Windows. Developers can extend this Project using plug-ins to add support for all the desired devices cooperation with.

-ago control: This is an open source home automation solution. It provides a frame to control the device in your home. It ZWave, X10, Some others.

-Home Genie: This is an open source home automation solution. Designed as a home server. Customizable According to your needs. Home Genie can communicate with X10. Insteon, ZWave, Philips Hue, UPnP, RFXCom devices, … etc.

It also communicates and integrates with external web services All of this is done in a typical automated environment.

I.10. The advantages and disadvantages:

I.10.1. The advantages:

- The main advantage of home automation is the improvement of daily life within the home, from the point of view of comfort, safety and energy management.
- This type of equipment simplifies your life and optimizes your comfort by adapting your house to different scenarios of everyday life.
- It allows you to turn off all your electrical appliances and put the alarm when you leave your home, to adjust light atmospheres (reading atmosphere, relaxation atmosphere with dimmed lights), to wake up in a heated habitat where the coffee is already ready, to automatically start watering or the opening of the shutters every morning.
- Home automation also saves energy through management automatic heating, air conditioning and lighting and programming household appliances during off-peak hours.
- It has the advantage of improving security through alarms, systems automatic door opening (voice recognition, magnetic card, etc.)
- In case of attempted intrusion into the house, an automatic phone call can contact the owner or a security company.

I.10.2. Disadvantages:

- The price is much higher but energy bills will go down. It is therefore necessary to take into account in the initial budget.
- the lock that some brands offer in their products that do not allow to have open software.
- Net Data's 2016 report stated that 80% of U.S. consumers are concerned about the security of their smart home data, because hackers can turn off lights, alarms, open doors, and leave the house unprotected.
- Furthermore, the report stated that 73% of consumers fear that manufacturers will know the privacy of their personal data by their smart home devices. Smart Home platform manufacturers collect consumer data to better adapt their products or to provide new and improved services.

Conclusion:

In this part we presented a overview of the technology of automated home automation and smart. And we completed with a global proposal for a communicating house in realize. In the chapters that will follow we will detail little by little the design, realization and integration of the different components of our smart home.

CHAPTER II

Reviews of Sensors and the other components

II.1. Introduction:

This chapter presents the basic elements to realize this project, the hardware consisting of sensors used to convert physical quantities into quantities of different properties, usually electrical. There is also an Arduino board to control the system under investigation. Finally, the software consists of applications such as the IDE responsible for programming our system, Fritzing and Remote XY for our additional circuits.

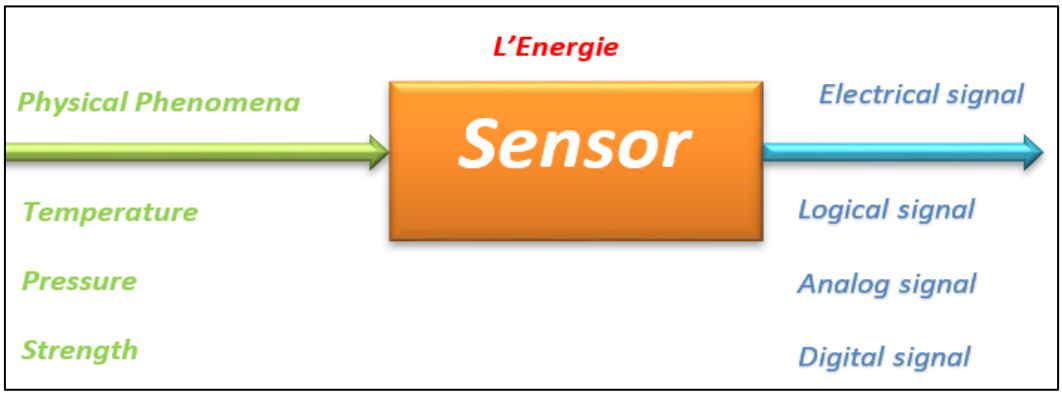
II.2. Sensors:

II.2.1. definition

A sensor (also known as a transducer) is a device that measures physical phenomena (room temperature, light source intensity, force on an object, etc.) and produces a measurable electrical signal. Depending on the type of sensor, the electrical output can be a voltage, current, resistance, or other electrical attribute that changes over time in response to changes in physical phenomena.

A sensor can also be thought of as an information-gathering organ that processes one physical quantity (received information) to another physical quantity of different nature (transmitted information: very often electricity).

Each sensor basically consists of two components, a test object and a detector (sensitive element) .



FigureII.1: sensor

II.2.2. CLASSIFICATION OF SENSORS:

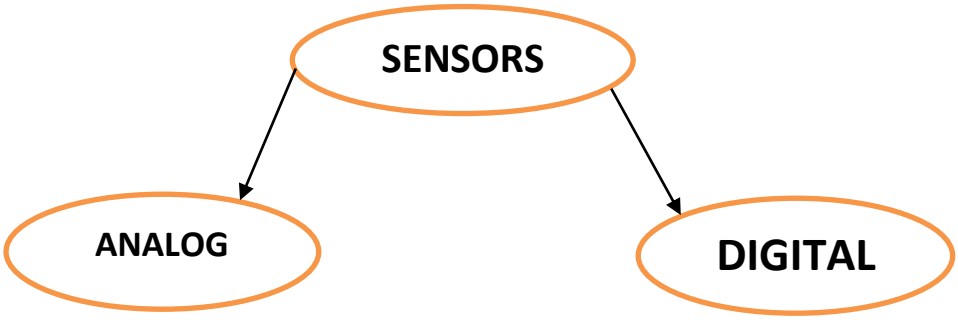
There are many possible classifications of allergies, some easy and simple, others difficult and complex, and in this article, we will hopefully review the easiest and most common classification, as the sensors are classified into two groups:

• **Active sensors:** Act like an energy generator that converts energy associated with physical quantity into electric energy (current, voltage or charge) and can operate even without an external feed source. Example: Photovoltaic cells convert photovoltaic intensity into an electrical current or voltage.

• **Passive sensors:** Act as a variable resistance, so in order to give us an electrical voltage (or current or charge) at the exit we must connect them with an external feed source. Example: We can use variable resistance as a sensor for movement.[7]

II.3. Types of sensors:

The sensors can be classified into 2 groups according to the nature of the information delivered at the output



FigureII.2: Types of sensors

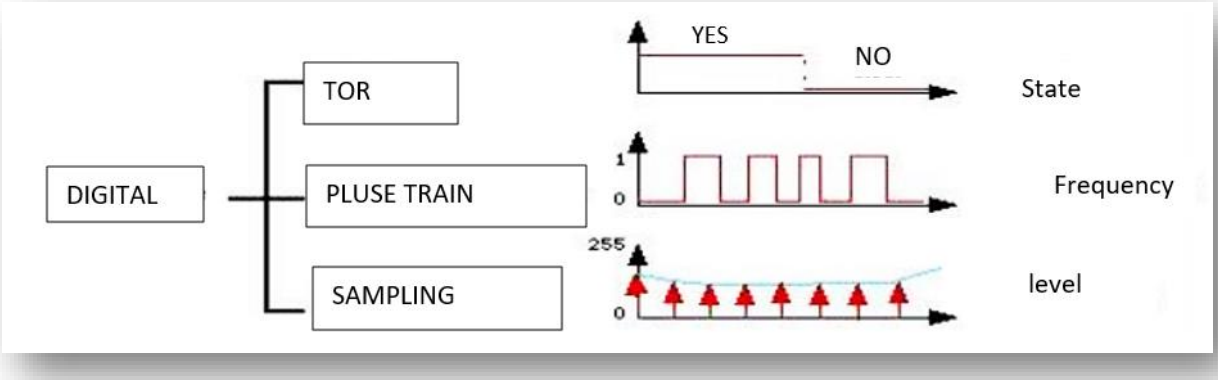
II.3.1. Digital sensors

Digital sensors give a finite value as output. For example, if a physical quantity grows in a linear way, the output of the sensor that will measure it will give either information of the type "TOR" (All or Nothing), pulse train or sampling**.[8]:**

- **all or nothing (TOR):**it informs about the state of a system that can only have two stable states such as a valve. If this valve is open, the output of the sensor will be assigned a "0" or a logical "1" according to the will of the sensor designer and the output will take the other value if it is closed. This type of assembly is called "bivalent": it is the fact that the output of the assembly cannot take only two values (open/closed,1/0).

- **pulse train:** each pulse is the image of a change of state. For example, an encoder incremental gives a finite and known number of pulses per turn.

-**sampling:** this is the digital image of an analog signal in the form of a "staircase" (on finds this characteristic in the output of analog / digital converters). For a Input voltage interval, corresponds to a single value of the output.



FigureII.3: Types of Digital sensors

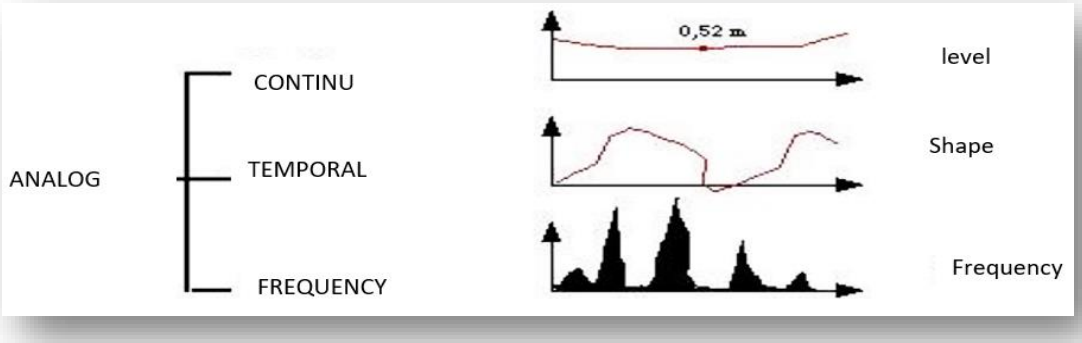
II.3.2. Analog sensors

Analog sensors are used to transform a physical quantity into another type of variation of impedance, capacitance, inductance or voltage. A signal is said analog if the amplitude of the physical quantity it represents can take an infinity of values in a given range. Thus, it can be said that the sinusoidal sector voltage(230VAC) is an analog type signal.

- **continuous signal:** it is a signal that varies "slowly" over time and that we find at the output of a temperature, pressure or pressure probe of a resistance photo.

- **temporal:** this is the form of this signal over time. It is also the trace of the signal on the screen of an oscilloscope.

- **frequency:** it is the frequency spectrum that carries the desired in format.



FigureII.4: Types of analog sensor

II.4. Different Types of Sensors:

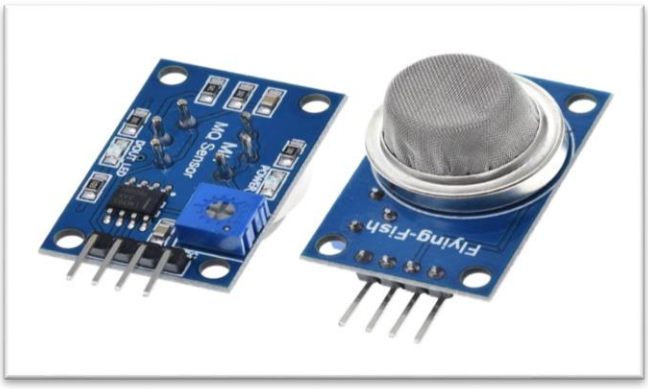
The following is a list of different types of sensors that are commonly used in various applications. All these sensors are used for measuring one of the physical properties like Temperature, Resistance, Capacitance, Conduction, Heat Trans.

Table II.1: types of sensor

Noun	Humidity sensor	Gas sensor	Motion sensor	Ultrasonic
Pictures				
Noun	Flame sensor	Vibration sensor	Clock	Sound sensor
Pictures				

II.4.1. Gas sensor(MQ2) :

In our model, an MQ2 gas sensor was used (see FigureII.5:), which is useful for the detection of gas leaks (home and industry), which is based on its fast response time. MQ2 can detect H2, LPG, CH4, CO, alcohol, smoke, and propane. Measures can be taken as soon as possible. In addition, the sensitivity can be adjusted by the potentiometer. [9]



FigureII.5: MQ2 gas sensor.

II.4.1.1. Technical characteristics of the gas sensor(MQ2):

• Power supply: 5V (DC, AC).

• GND: the diet is negative.

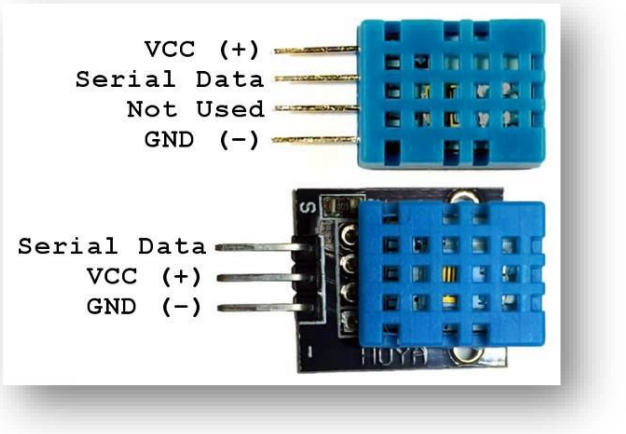
• Dimension: 32.4 mm / 20.4 mm.

II.4.2. Temperature and Humidity Sensor (DHT11):

A DHT11 temperature and humidity sensor (Figure II.6) was used. It can measure temperatures from 0 to + 50 ° C with accuracy and speed of +/- 2 ° C.

relative humidity of 20 to 80% with an accuracy of +/- 5%. A measurement can be made every second.

A resistive humidity sensor and a microcontroller that takes care of making the measurements, converting them and transmitting them.



FigureII.6: Temperature and Humidity Sensor (DHT11)

II.4.2.1. Technical characteristics of (DHT11):

• Power supply: 5V.

• Consumption: 0.5 mA in nominal / 2.5 mA maximum.

• Range of temperature measurement: 0°C to 50°C ± 2°C.

• Range of humidity measurement: 20-90%RH ±5%RH.

• Measurement period: 2s.

• Dimensions: 12*15.5*5.5mm

II.4.3. Motion sensor(PIR) :

A PIR sensor (passive infrared, pyroelectric or "infrared") is used as a motion sensor. These allow you to determine if a human has entered or exited the module's detection field.

These small sensors are durable, low cost, ultra-compact, and widely used in both the design and prototyping of small electronic objects and devices based on motion detection.**[10]**

FigureII.7: Motion sensor(PIR)

II.4.3.1.Technical specifications of the PIR sensor:

- Power supply: 5-16V.
- Digital output signal: 3.3V.
- Range: 7m.
- Detection cone: 120°.
- Adjustable sensitivity and response time (2-4 s).
- 30 cm cable included.
- Length: 24.03 mm.
- Depth: 32.34 mm.
- Distance from screw holes: 28 mm.
- Screw hole diameter: 2 mm.
- Height (with lens): 24.66 mm.
- Weight: 5.87 g.

II.5. the components:

II.5.1. Relay module:

A relay is an electric switch that allows you to control a second circuit using a voltage and current much higher than the Arduino can accept (for example, turning a 220 V light bulb on and off). Simply put, it can be defined as a simple on / off switching mechanism. It closes when the input is 5V and opens when the input is 0V. Similarly, there is no connection between the Arduino low voltage and high voltage circuits.

Figure II.8: Relay module

II.5.1.1. Technical characteristics of relays:

- The power pin is on the left side of (Figure II.8) :

Table II.2: The power pin of The Relay module

Pin	explication
C	The pin is connected to a cable that carries power (for example, a "+" cable powers the device that controls power).
NO	The pin receives the current arriving through the "C" pin when the relay is activated via the "Signal" control pin.
NC	The pin receives the current arriving through the "C" pin when the relay is deactivated.

❖ The control pin is on the right side of (Figure II.8) :

Table II.3: The control pin of The Relay module

pin	explication
Terre	The pin should be connected to ground
Alim 5V	The pin should be connected to a 5V power supply that Arduino can supply.
Signal	The pin controls the activation of the relay. ➢When a current of 5V flows through the "signal" pin, the current received by the power supply pin "C" is switched to the power supply pin "NO". ➢if the "signal" pin does not receive current, the current received on the power pin "C" is switched to the power pin "NC".

II.5.2. The HC05 Bluetooth Module:

is an easy-to-use Bluetooth SPP (Serial Port Protocol) module designed to set up a seamless wireless serial connection? The communication is via serial communication, facilitating the interface with the controller or PC. HC05 Bluetooth module provides switching mode between

Master mode and slave mode. That is, you cannot receive or send data.

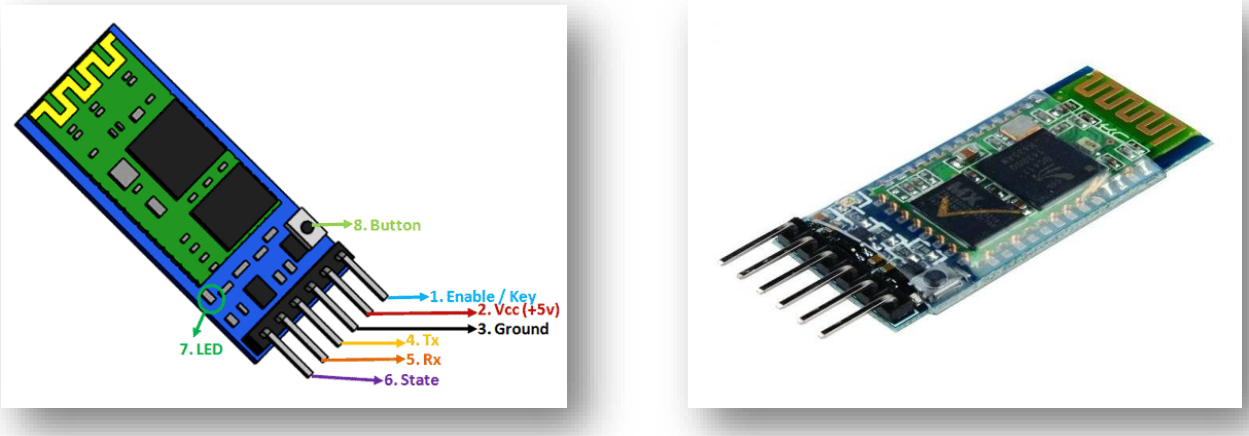


Figure II.9: The HC05 Bluetooth Module

II.5.2.1. Technical features of HC05:

• Model: HC05.

• Input voltage: DC (+ 5V).

• Wireless technology type: Bluetooth.

• Dimensions: 5.1 x 3.8 x 0.3 cm.

• Default password: 1234 or 0000.

• Standard communication: Slave.

• Standard mode: Data mode.

• Operating current: 30mA.

• Weight: 4.54g.

• key: ✓ VCC: + 5V. ✓ GND: Mass.

✓ TXD: Arduino pin RX. ✓RXD: Arduino pin TX.**[11]**

II.5.3. "Buzzer" sound module:

Buzzers can be found in alarm devices, computers, timers and user input confirmation, it is a continuous tone with a minimum sound output of 70 dB at 1 m for its size. It has a rated electrical power of 3 V and 150 mA.

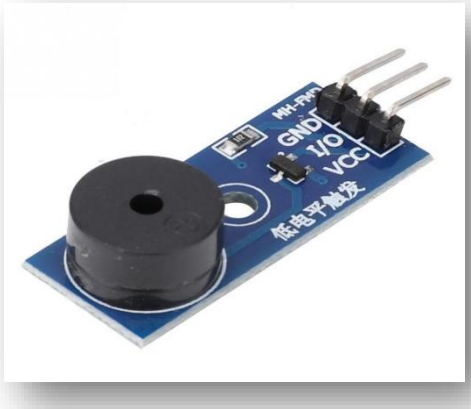


Figure II.10:"Buzzer" sound module

II.5.3.1. Technical characteristics of the buzzer:

- Dimensions: approximate diameter of 12 mm.
- height 9mm.
- Ringtone type: continuous.
- Supply voltage: 2V - 4V.

- 2 pins: positive and negative.

II.5.4. Module Wi-Fi NodeMCU ESP8266

A module based on ESP8266 that is clocked at 80MHz and is running open source Node MCU firmware. This board is programmed via the Arduino IDE and is compatible with LUA scripts.

This microcontroller has the best Wi-Fi interface for connected objects. Male and female connectors on the side allow the module to be plugged into the quick mounting panel. The wireless Wi-Fi interface allows you, for example, to create wireless access points, host servers, connect to the Internet, and share data. The

module is programmed directly from the Arduino IDE (extension installation required) and requires a Micro USB cable (not included). Its implementation makes it compatible with Quick Connect Plates. **[12]**

Figure II.11: Module Wi-Fi NodeMCU ESP8266

II.5.4.1. Technical characteristics of Wi-Fi NodeMCU ESP8266:

Feeding:

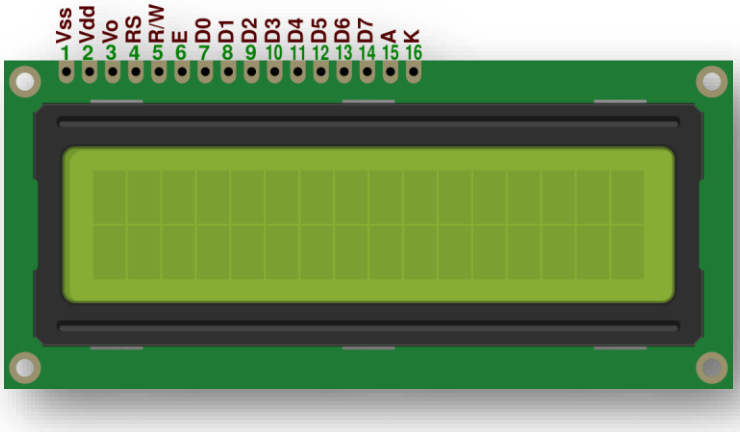
- 5 Vdc via micro-USB.
- 5 to 9 Vdc via Vin pin (integrated regulator).
- Microcontroller: ESP8266.
- Microprocessor: Ten silica LX106.
- Frequency: 80MHz.
- RAM memory: 64 KB.
- Flash memory: 96 KB.
- WIFI interface 802.11 b/g/n 2.4 GHz.

- Built-in antenna.

II.5.5. LCD Display Module

Alphanumeric LCD displays present an easy-to-use and good solution market to equip your project with an interface independent of your PC.

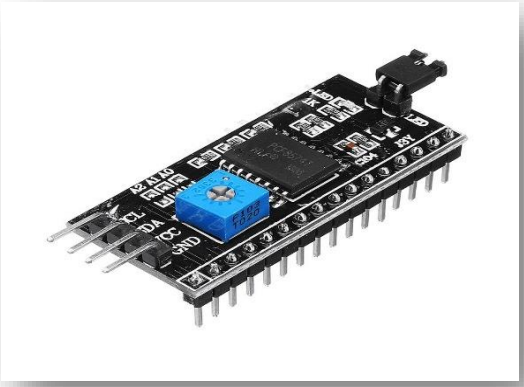
Seen from the outside, alphanumeric LCD screens are essentially characterized by their size. Two models meet very frequently and are the cheapest, the one having 2 rows and 16 display columns and the one having 4 rows and 20 display columns.



FigureII.12: LCD Display Module

II.5.6.Inter-integrated circuit (I2C):

The I2C protocol involves using two lines to send and receive data: a serial clock pin **(SCL)** that the Arduino Controller board pulses at a regular interval, and a serial data pin **(SDA)** over which data is sent between the two devices. As the clock line changes from low to high (known as the rising edge of the clock pulse), a single bit of information - that will form in sequence the address of a specific device and a a command or data - is transferred from the board to the I2C device over the SDA line. When this information is sent - bit after bit -, the called upon device executes the request and transmits it's data back - if required - to the board over the same line using the clock signal still generated by the Controller on SCL as timing. Because the I2C protocol allows for each enabled device to have it's own unique address, and as both controller and peripheral devices to take turns communicating over a single line, it is possible for your Arduino board to communicate (in turn) with many devices, or other boards, while using just two pins of your microcontroller.**[13]**



FigureII.13: I2C

II.5.7. DC motor 5v:

A DC motor or DC motor is an electrical machine that converts electrical energy into mechanical energy by generating a magnetic field powered by direct current. When a DC motor is powered, a magnetic field is generated in its stator. The magnetic field attracts and repels the magnets in the rotor. This will rotate the rotor. A commutator attached to the brush connected to the power supply powers the windings of the motor to keep the rotor rotating continuously.

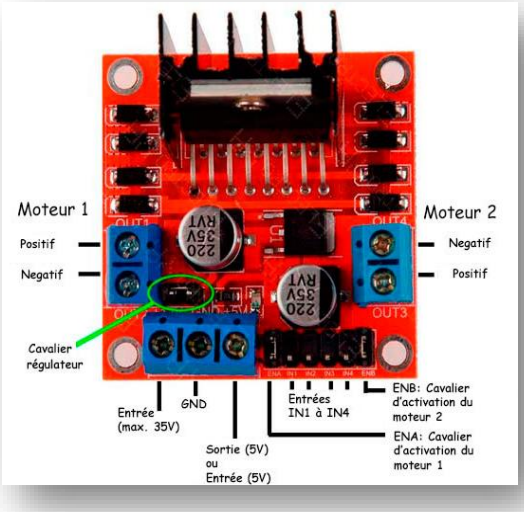
One of the reasons why DC motors are preferred over other motor types is that they can accurately control the speeds that are essential for industrial machinery.

DC motors can be started, stopped and reversed instantly-an essential element in controlling the operation of production equipment.

FigureII.14: DC motor 5v

II.5.8. Controller L298N Dual H-Bridge Motor:

This bidirectional dual engine driver is based on the very popular H-bridge L298 dual deck engine driver IC. This circuit allows easy and independent control of two motors, each up to 2A, in either direction. Ideal for robotic applications and ideal for interfacing with microcontrollers that require only a few control lines per motor. It can also interface with simple manual switches, TTL logic gates, relays, and more. The board is equipped with a power LED indicator, a built-in + 5V regulator, and a protection diode.**[14]**



FigureII.15: Controller L298n Dual H-Bridge Motor

II.5.8.1. Technical characteristics of Controller L298n Dual H-Bridge Motor:

- Input voltage: 3.2V~40Vdc.
- Driver: Dual-deck DC engine driver in H L298N.
- Power supply: DC 5 V - 35 V.
- Peak current: 2 A.
- Operating Current Range: 0~36mA.
- Input voltage range of the control signal:
- Low: -0.3V ≤ Wine ≤ 1.5V.
- High: 2.3V ≤ Wine ≤ Vss.
- Enable signal input voltage range:
- Low: -0.3 ≤ Wine ≤ 1.5V (the control signal is not valid).
- High: 2.3V ≤ Wine ≤ Vss (active control signal).
- Maximum power consumption: 20W (when temperature T = 75 °C).

Conclusion:

Through this chapter we have presented in detail the different components electronic to complete our specifications. And in the chapter that follows we will address how our system works.

CHAPTER III

Test and Application

III.1. Introduction

In this chapter, a full study will be conducted on the mechanism of smart home design and control by smart phones, and all this is based on the analysis of the project idea in detail in this part.

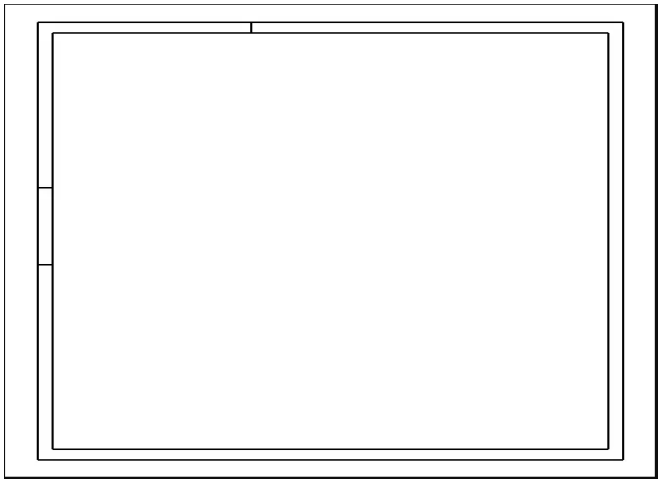
III.2. Conception of the smart home

III.2.1. Design of the home:

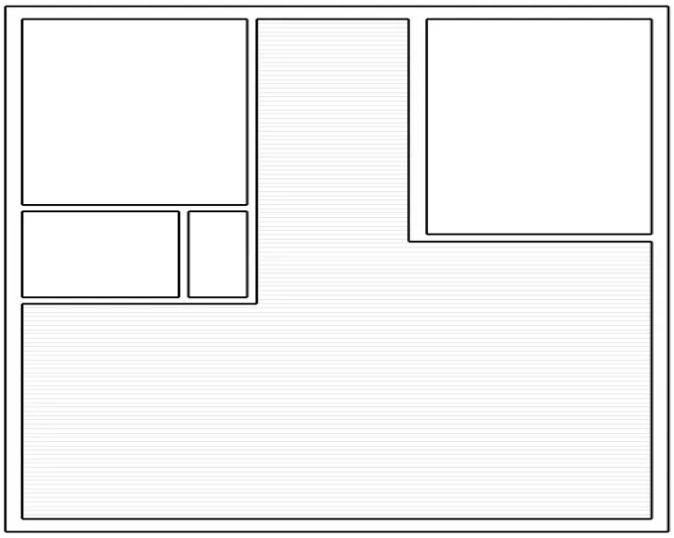
We used the design of this home, the famous AutoCAD program.

III.2.1.1. Pictures of the house 2D:

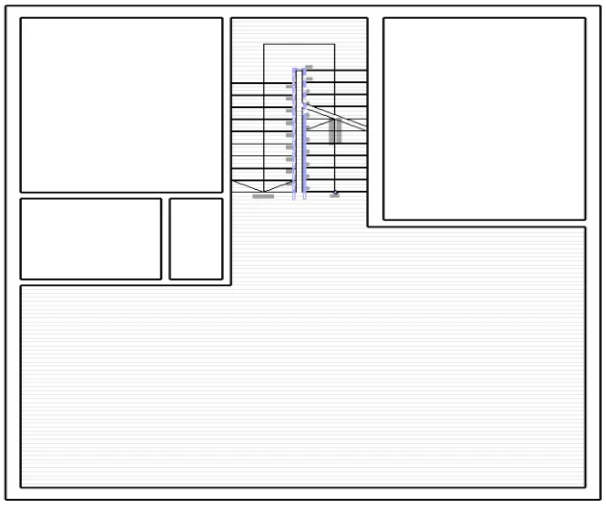
Step 1: Design the exterior walls of the house.



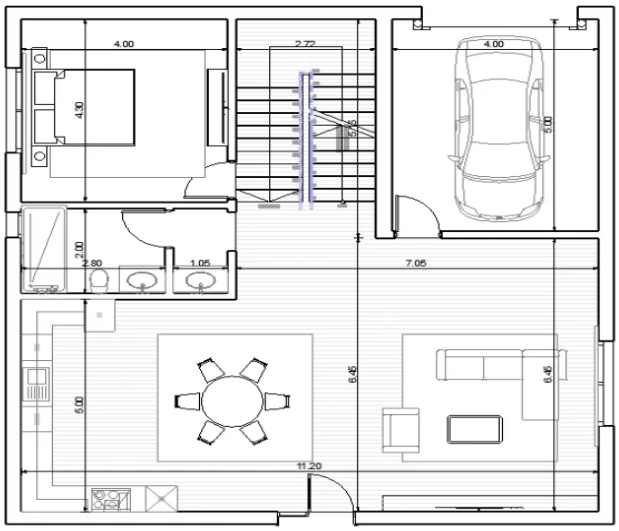
Step 2: Design the interior walls of the house.



Step 3: Ladder design.



Step 4: the final design with the dimension.



III.2.1.2. Dimension of the prototype:

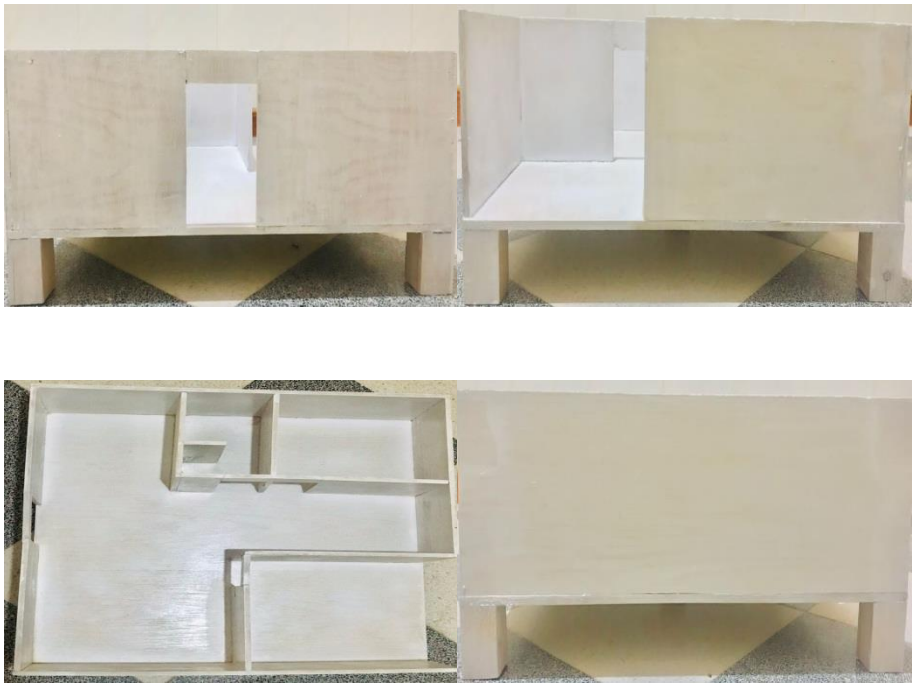
TABLAU III.1: Dimension of the prototype

Dividing the house	Dimension (L x W x H)
Room	18 cm x 16 cm x 15 cm
Kitchen	19 cm x 17 cm x 15 cm
Garage	23 cm x 20 cm x 15 cm
Toilet	16 cm x 18 cm x 15 cm
Hall	27 cm x 22 cm x 15 cm
Ladder	15 cm x 14 cm x 15 cm

III.2.2 Assembling parts of the home:

III.2.2.1. Pictures of the house 3D:

III.2.2.2. Pictures of the house actually :



III.3. Software and Hardware of The system

III.3.1.Hardware:

III.3.1.1. Interface card:

The interface boards of the system (Arduino, Dragon, Orange PI, Raspberry PI, ...) are families of microcontrollers that can capture and control more things from the hardware world. These are generally open-source programmed electronics platforms.

A microcontroller is the main component in these boards. It is an integrated circuit that brings together the essential elements of a computer: processor, memory (read-only memory and RAM), peripheral units and input-output interfaces. Microcontrollers are characterized by a higher degree of integration, lower power consumption, lower operating speed (from a few megahertz to more than one gigahertz), and lower cost compared to versatile microprocessors used in personal computers.

Compared to electronic systems based on microprocessors and other individual components, microcontrollers reduce product size, power consumption, and cost. Therefore, they have enabled the democratization of computer use in numerous products and processes.

Microcontrollers are widely used in embedded systems contained in electronic circuit boards, including smart homes.

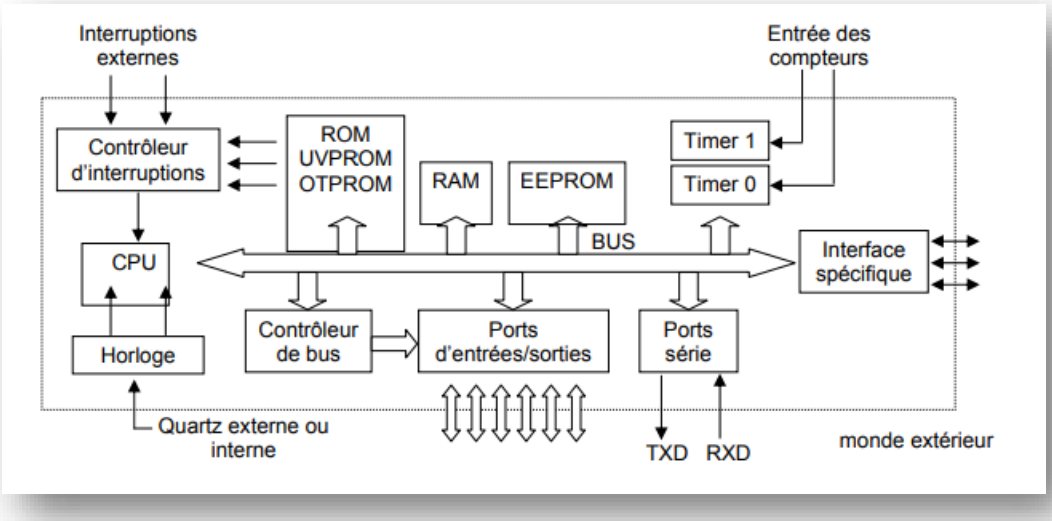
III.3.1.2. General architecture of a microcontroller:

The microcontroller is a derivative of the microprocessor. Its structure is that of microprocessor-based systems. It is therefore composed of a central processing and control unit (equivalent to the microprocessor), memories and input/output ports. In addition to this minimum configuration, microcontrollers are equipped with one or more metering systems (TIMER).

Some have a built-in analog-to-digital converter (ADC). These additional advantages allow many applications such as: - analog data acquisition and processing (CAN) - event counting (TIMER) - frequency or period measurement (TIMER) - pulse generation (TIMER) .

• the programs can be different (management of a smart thermostat, a photocopier).

•programs have complex calculations in common unlike a computer system. **[15]**



FigureIII.1: General architecture of a microcontroller

A minimal programmable system to operate as needed:

• a central unit.

• read-only memories for the program (PROM, EPROM).

• RAMs, for calculations, to store data.

• interface circuits, to connect the devices that will allow the communication with the outside world.

III.3.1.3. Interface card example

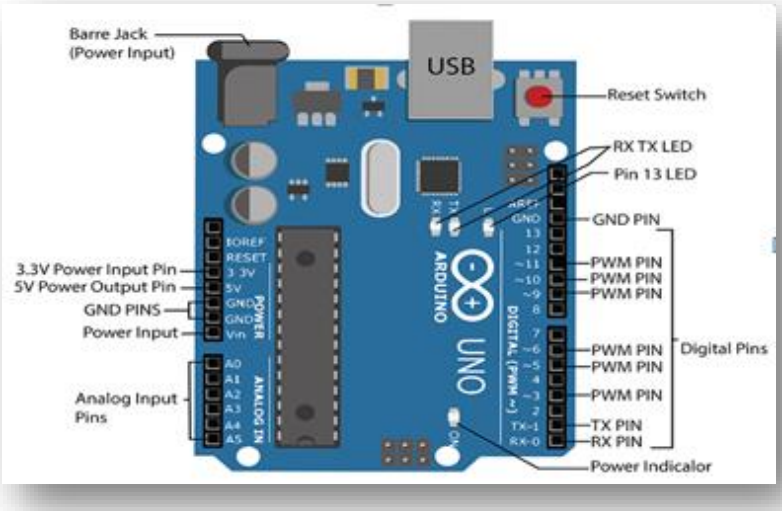
There are various interface cards used in many areas, including home automation. Each card has its advantages and disadvantages, and each designer can choose the card that suits him best. and these are the most famous and used species (Arduino, Dragon, Orange PI, Raspberry PI).

In our project we use the Arduino board as an interface between the sensors/shareholder and the phone that runs the main application of home automation.**[15]**

III.3.1.4. Arduino:

III.3.1.4.1. Definition:

Arduino is a platform for prototyping interactive objects for creative use, consisting of a Electronic board and programming environment. without knowing anything or everything This hardware and software environment enables users to understand electronic Develop projects through direct experimentation using many resources Available online.



FigureIII.2:Description of the components of the Arduino UNO board

III.3.1.4.2. Application:

The Arduino system allows us to implement all kinds of things that have applications in various fields! Some examples: **[16]**

• Control home appliances.

• Build your own robot.

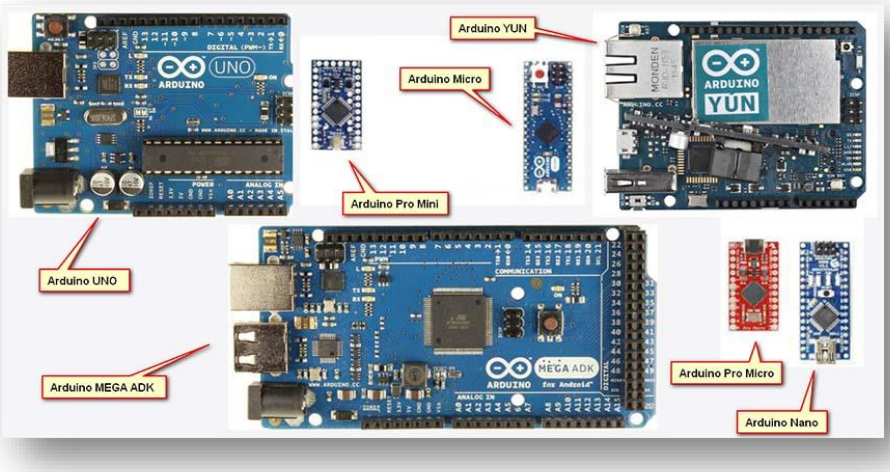
• Have a light show.

• Communicate with computers.

• Remote control of mobile device.

III.3.1.4.3. The different Arduino boards

FigureIII.3shows the models of Arduino boards that vary in shape, size, and connectivity options, which is why developers create a variety of microcontroller boards so that everyone can find a model that suits their needs. **[17]**



FigureIII.3: The different Arduino boards

We will specify the various qualities of the Arduino family, of these we have decided to make reference to the three most utilized sheets (NANO, UNO, MEGA).

TABLE III.2: Characteristics between the most three Arduino uses

Characteristics	**UNO**	**Mega 2560**	**Nano**	
Microcontroller	AT mega 328	AT mega 2560	AT mega 168 or 328	
Clock Frequency	16MHz	16MHz	16MHz	
Operating voltage	5V	5V	5V	
Input voltage (recommended)	7-12 V	7-12V	7-12V	
Input voltage (limits)	6-20V	6-20V	6-20V	
Digital ports	14 inputs and outputs	54 inputs and outputs	14 inputs and outputs	
Analog ports	6 analog inputs	16 analog inputs	8 analog inputs	
max current, per I/O pin (c.c.)	40mA	40mA	40mA	
maximum current. Per pin 3.3 V	50mA	50mA	/	
Memory	32 Ko Flash 2 Ko SRAM 1 Ko EEPROM	256 Ko Flash 8 Ko SRAM 4 Ko EEPROM	AT mega 168	AT mega 328
			16 Ko mémoire Flash 1Ko SRAM 512 octets EEPROM	32 Ko mémoire Flash 2Ko SRAM 1 Ko EEPROM
Boot loader	0.5KB (in Flash memory)	8KB (in Flash memory)	2KB (in Flash memory)	
Interface	USB	USB	USB	
Size	6.86cm x 5.3cm	10.16 cm x 5.3 cm	1.9 cm x 4.3 cm	
Price (approximate)	24 €	47 €	40 €	

We chose the Arduino UNO board because it has several advantages that suit us in our realization:

• It has a good market with an affordable price.

• It has a sufficient number of input/output pins for our realization.

• It is perfect for anyone who wants to get their start with a microcontroller.

• It is a safe bet.

• Perfect to start Arduino programming.

III.3.1.5. Gas sensor MQ2:

Technical characteristics of the MQ2:

TABLE III.3: Technical characteristics of the MQ2

Power supply	Interface type	Pin	Dimension	Concentration
5V (DC, AC).	analog.	**VDC**: positive power supply (5 V). **GND**: the diet is negative. **Do**: TTL switching signal output. **AO**: analog signal output.	32.4 mm / 20.4 mm	300 ppm – 10000 ppm.

-Advantages:

• Quick response.

• High sensitivity

• Long service life.

-Disadvantages:

- Only one gas can be measured with each instrument.
- Not used in industrial facilities

III.3.1.6. Temperature and Humidity Sensor [DHT11]:

Technical characteristics of DHT11:

TABLE III.4: Technical characteristics of DHT11

Power supply	Consumption	Range of temperature measurement	Range of humidity measurement:	Measurement period	Dimensions:
5V	0.5 mA in nominal / 2.5 mA maximum	0°C to 50°C ± 2°C.	20-90%RH ±5%RH.	2s	12*15.5*5.5mm

-Advantages:

- Low power consumption and excellent long-term stability.
- Relatively high measurement accuracy can be obtained at a very low cost.
- Single-bus digital signal output through the built-in ADC, which saves the I/O resources of the control board.

-Disadvantages:

- It is difficult to use below temperature of 0°C and with lower humidities.
- Long term measurement is limited due to required water reserve and wick maintenance.

III.3.1.7. DC motor 5v:

Technical characteristics of DC motor

TABLE III.5: Technical characteristics of DC motor

Electrical characteristics	**Power source**	**5v**
	Motor voltage	4-6-9-12-24v
	terminal	2
	Puissance	Min: 10 W (0,014 hp) Max: 50 W (0,068 hp)
Mechanical characteristics	weight	17 grm
	Direction of working	Both clock andante-clockwise
	Starting torque	20g/cm
	Loaded speed	5000 rpm

III.3.1.8.Controller L298N dual H-bridge motor:

Technical characteristics of Controller L298N dual H-bridge motor:

TABLE III.6: Technical characteristics of Controller L298N dual H-bridge motor.

Height: 3.4 cm x 4.3 cm x 2.7Driver name	**Dual-deck DC engine driver in H L298N**
Power supply:	DC 5 V - 35 V
Input voltage:	3.2V~40Vdc.
Peak current:	2 A
Input voltage range of the control signal:	Low: -0.3V ≤ Wine ≤ 1.5V. High: 2.3V ≤ Wine ≤ Vss.
Enable signal input voltage range:	Low: -0.3 ≤ Wine ≤ 1.5V (the control signal is not valid). High: 2.3V ≤ Wine ≤ Vss (active control signal).
Maximum power consumption:	20W (when temperature T = 75 °C).

III.3.1.9.The HC-05 Bluetooth Module

Technical characteristics of HC05:

TABLE III.7: Technical characteristics of HC05

model	**HC-05**
Input voltage:	DC (+ 5V).
Wireless technology type	Bluetooth.
Dimensions:	5.1 x 3.8 x 0.3 cm.
Default password	1234 or 0000.
Standard communication:	Slave
Standard mode:	Data mode
Operating current:	30mA
Weight	:4.54g.

III.3.1.10. Other Electronic Components:

- LED:

LEDs (English: LEDs: Light Emitting Diodes) are optoelectronic components that are easy to assemble on printed circuit boards, consume less, have mechanical strength, are smaller in size, and have a longer service life., LEDs are increasing more and more. Indispensable

FigureIII.4: LED

-Resistance:

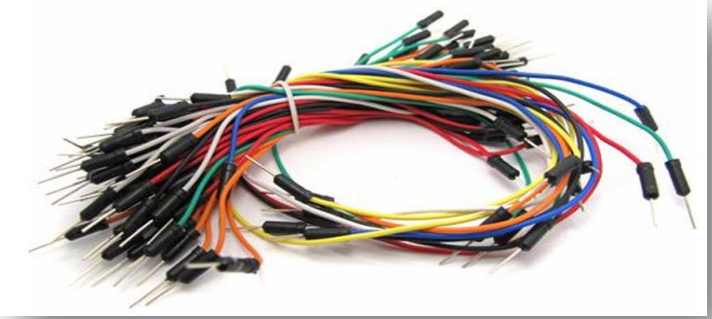
In electrical and electronic circuits, it is sometimes necessary to limit the intensity of the current in order to avoid damage to certain components. For these purposes, "technical resistors" are used: they are electrical/electronic components whose resistance has a well-defined value, they are cylindrical in shape as shown in Figure 15, consisting of a porcelain support and the whole is covered with a layer of protective varnish.

The resistance is reversible in connection.

FigureIII.5: Resistances

-Arduino Pin Wires:

These male wires are used to plug and connect the Arduino with other parts and for testing.

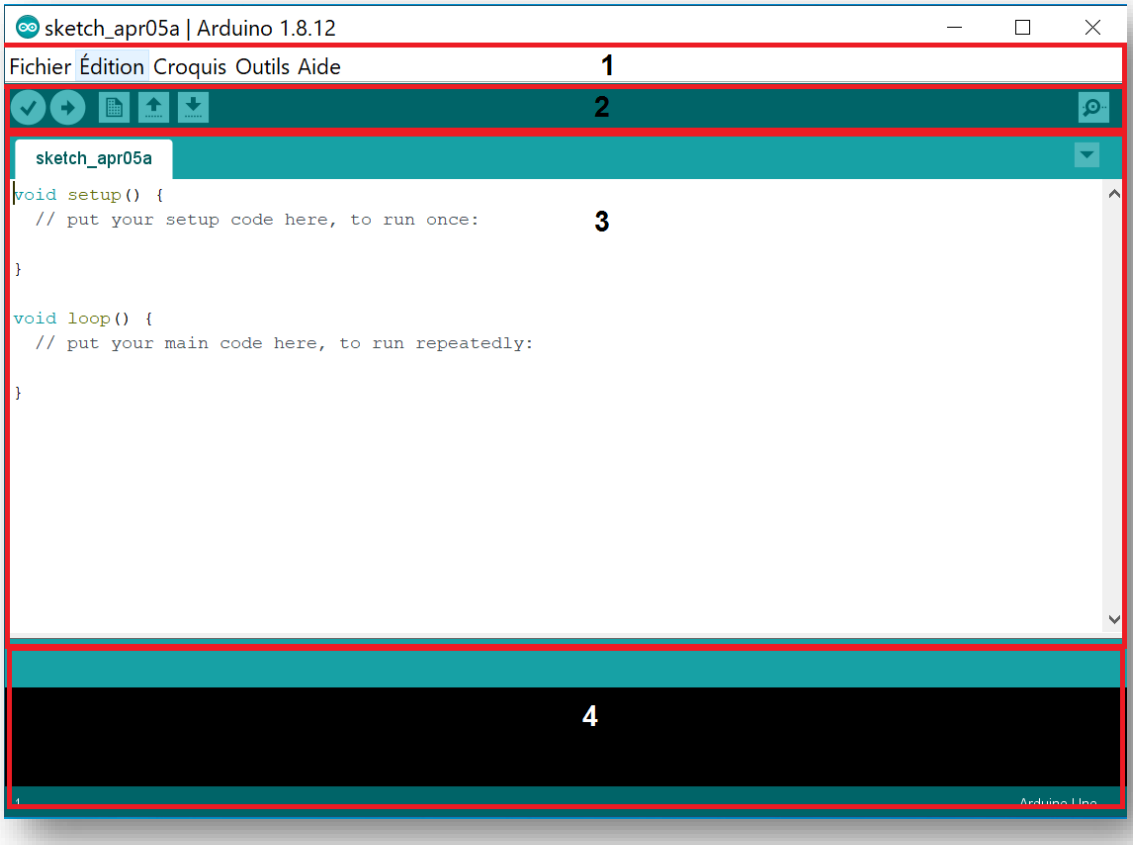


FigureIII.6: Arduino Pin Wires

III.3.2. Software:

III.3.2.1. Arduino IDE software:

Arduino IDE software works on Windows, Mac and Linux. It is thanks to this software that we will create, test and send the programs on the Arduino. This software has a simple interface consisting of four main blocks.**[18]**



FigureIII.7: IDE software interface.

1. Menu:

The different menu items allow you to create new sketches (programs), save them, and manage software preferences and communication settings with your Arduino board. The menu includes:

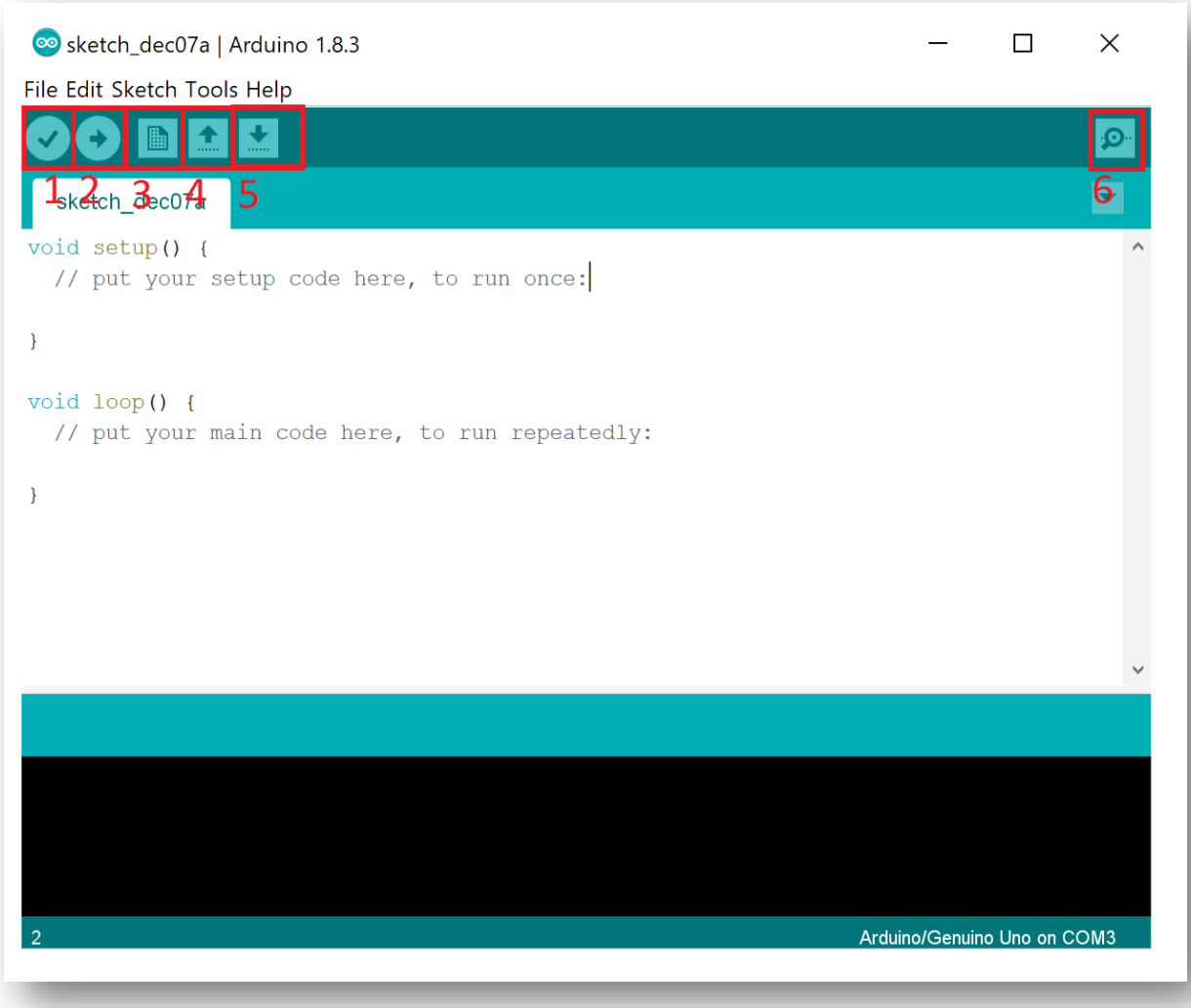
• File: to create, save by specifying the destination, and call a program.

• Editing: To cut, copy, paste, delete, select, etc.

• Sketch: groups the files made.

• Tools: to specify the card type, serial port, format, reload and repair encoding, burn the initialization sequence, of the card plugged into the computer.

2.The buttons:



FigureIII.8: Action buttons

• Button 1: This button allows you to check the program, it activates a module that looks for errors in the program

• Button 2: Load (upload) the program into the Arduino board.

• Button 3: Create a new file.

• Button 4: Opens a file.

• Button 5: Saves the file.

• Button 6: Opens the serial monitor.

Note: A serial monitor is a communication tool between your PC and an Arduinoboard connected via a USB port and is typically used to test the operation of your program.

3. Programming window**:**

It is the editor in which the program is written, and any software follows some concepts so that you can configure the program well, compile it, avoid syntax errors and so on.

4. Error bar:

The error bar shows errors that occurred during the program, such as missing semicolons, missing curly braces, and other errors in the statement.

III.3.2.2. Fritzing software:

We used this software just for the assembly of our electronic circuit.

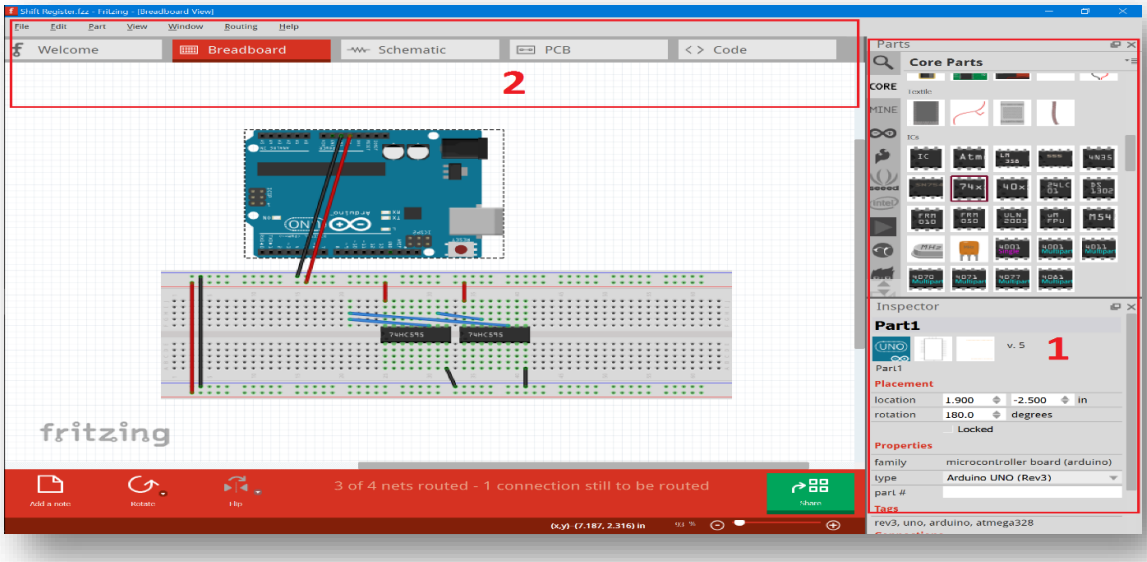


Figure III.9 :Fritzing software interface

Figure III.9 présente l'interface du logiciel Fritzing où elle est composée de 2 parties :

• Bloc 1 : Liste des composants.

• Bloc 2 : Barre d'outils composé de :

✓ Platine d'essai.

✓ Vue schématique.

✓ Circuit imprimé.

✓ Code.

III.3.2.3. AutoCAD:

AutoCAD, known as computer design (CAD), was first produced by Autodesk in December 1982 as a desktop program. Downloaded to computers with small graphics units, and in 2010 it was provided as a web application under the name AutoCAD (360), the latest version was released on March 25, 2020. The AutoCAD program allows the construction of a technical conception of industrial and engineering models, drawings and artistic ideas, as well as the possibility of modification and restructuring of ready-made designs, and to be proportionate to all uses, it has two types, as follows:

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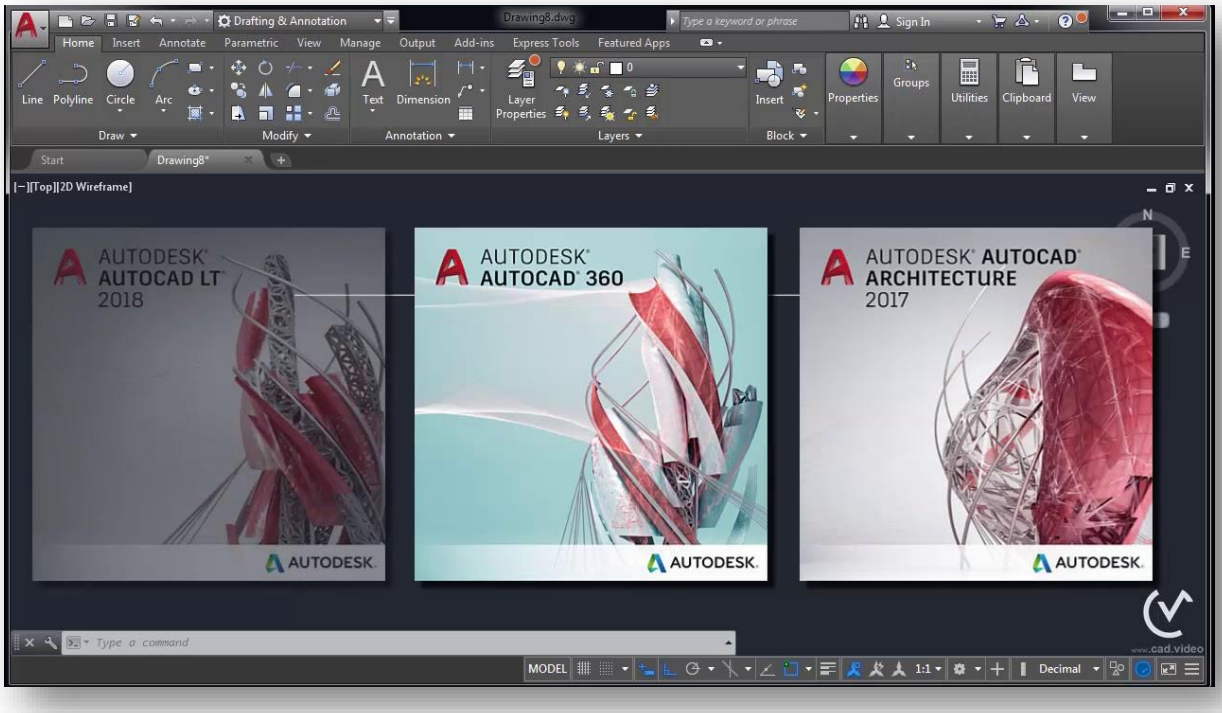


FigureIII.10: AutoCAD software interface

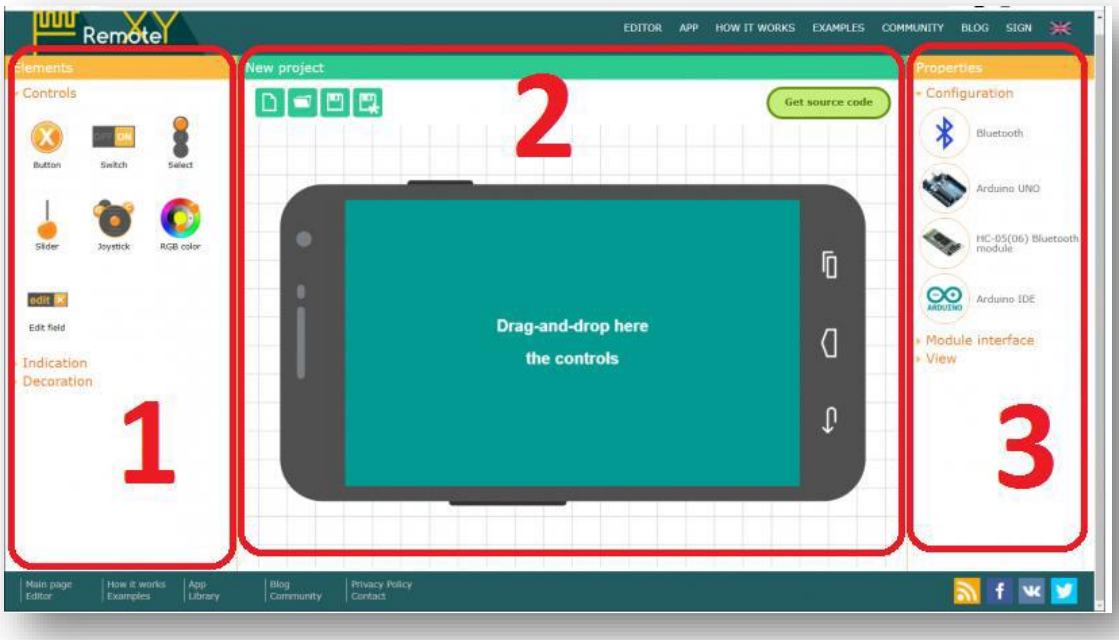
III.3.2.3.1. Type of AutoCAD

- AutoCAD 2D: The most famous genre, offering 2D flat drawings as well as measurements and information for any project, this type can be used to produce designs for different industries, mapping, garden design, fashion and fashion.
- AutoCAD 3D: This type of AutoCAD is similar to the first type, but what distinguishes the 3D AutoCAD program is the availability of more details of individual elements and components combined with each other, i.e. it shows how dimensions fit together, work and complement each other, rather than describing their size and giving an overview of their overall form only.

III.3.2.4. Application used:

III.3.2.4.1.RemoteXY App:

RemoteXY is a way to make a graphical interface for mobile user that connects to the Arduino using link (WIFI, Bluetooth). Using the mobile GUI editor, located on the http://remotexy.com site, we can make our own unique GUI and load it into the controller. Using this mobile application, one will be able to connect to the controller and manage with them through a graphical interface. The following figures show the steps to configure the connection between the Arduino UNO and the Smartphone. [18]



FigureIII.11: Interface of RemoteXY

According to FigureIII.11

• **Block 1**: Element panel.

• **Block 2**: Editor area.

• **Block 3**: Properties and settings panel.

• **Step 1: Project configuration**

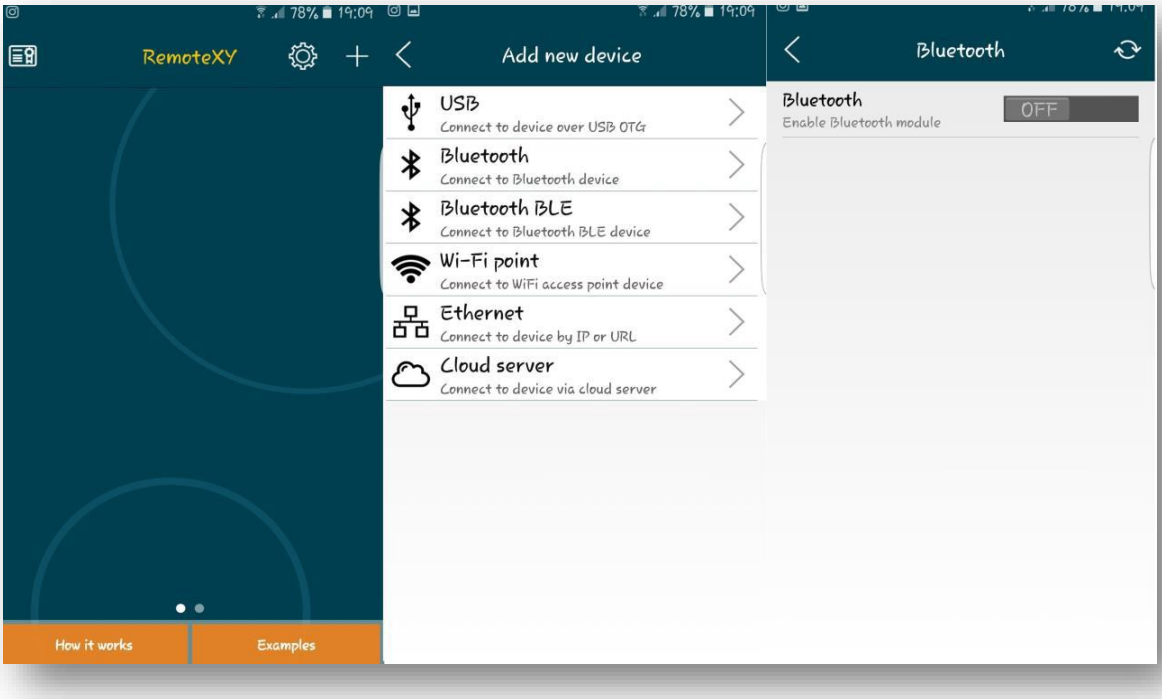
We have selected the settings (FigureIII.11) under the Configuration tab (properties and settings panel): Bluetooth, Arduino Uno, HC-05(06) Bluetooth module, Arduino IDE.

• **Step 2: Create Interface**:

The view part that defines the background color and the state of the Smartphone (horizontal, vertical, or both). You can add a password to access your own interface trained for the program, and then add elements: (Show and change decorations).

• **Step 3: Sign in from the mobile app**

The following image shows the steps to connect from the mobile



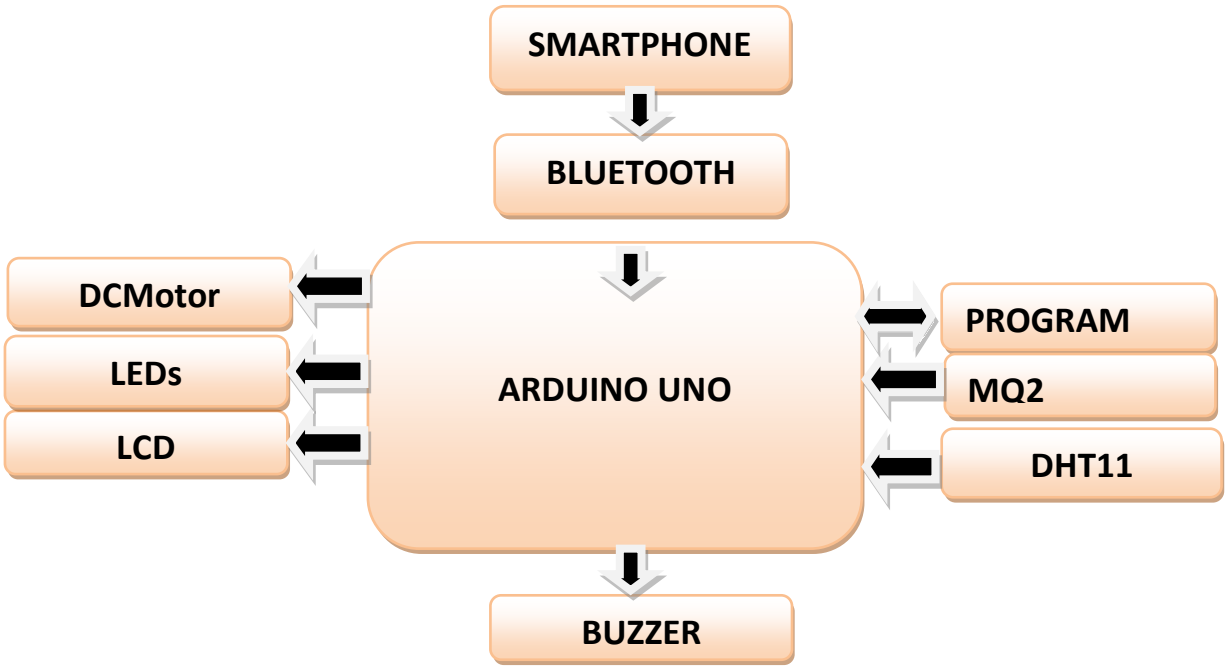
FigureIII.12: Screenshot of the Smartphone app (RemoteXY)

A. I have it. I have installed the RemoteXY mobile application on my Smartphone or tablet from the Play Store or App Store.

B. In the application, the (+) button for the new connection was pressed, then the "Bluetooth" connection was selected. In the window that opens, we make the "OFF" button in "ON".

III.4.Synoptic diagram

The following diagram represents respectively the synoptic representation of the general structure of the UNO card.



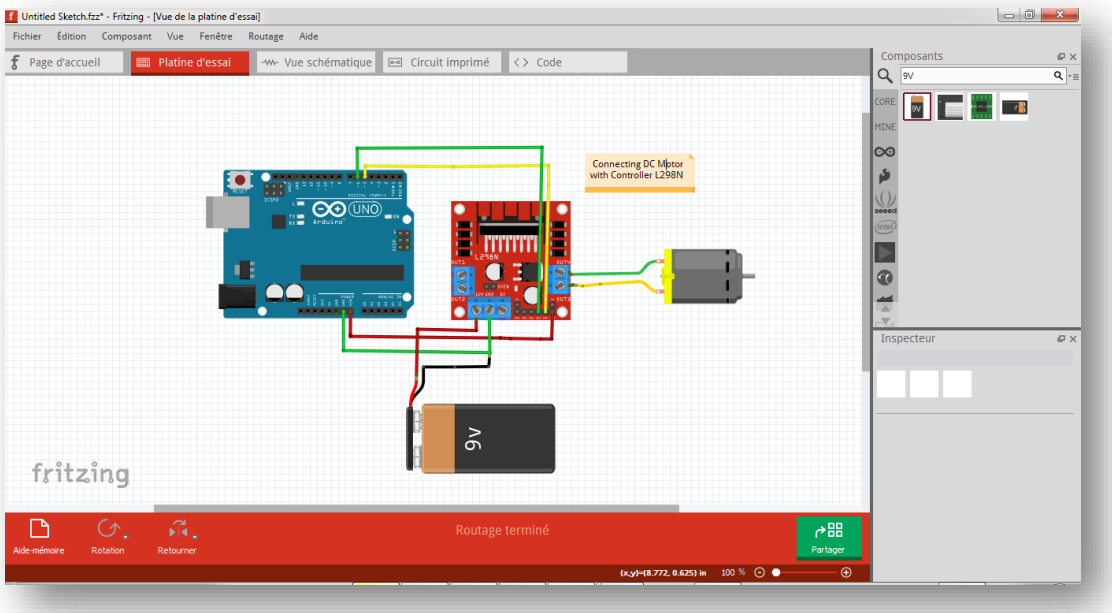
FigureIII.13: Synoptic diagram of the UNO card.

III.5. System connection:

In this part we will describe the connections made for the different components. (fritzing)

III.5.1. Automatic garage (DC Motor):

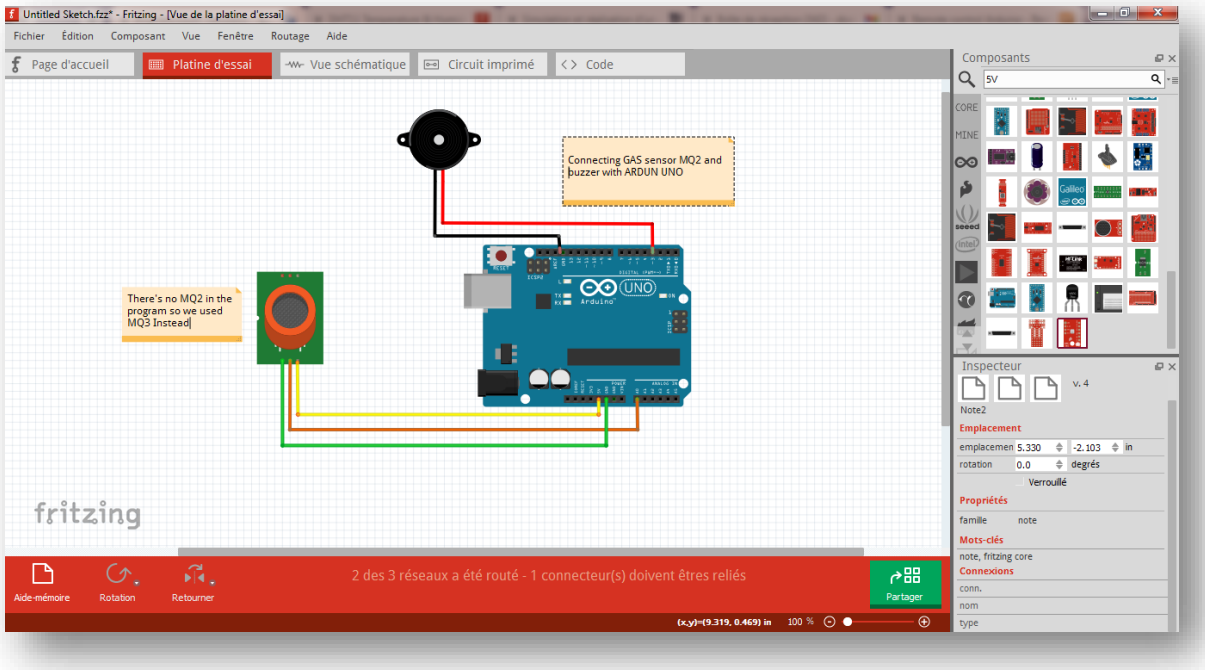
The diagram above shows the connections of the automatic garage.



FigureIII.14: Electrical diagram of the automatic garage

III.5.2. Leaking gas detection system (MQ2):

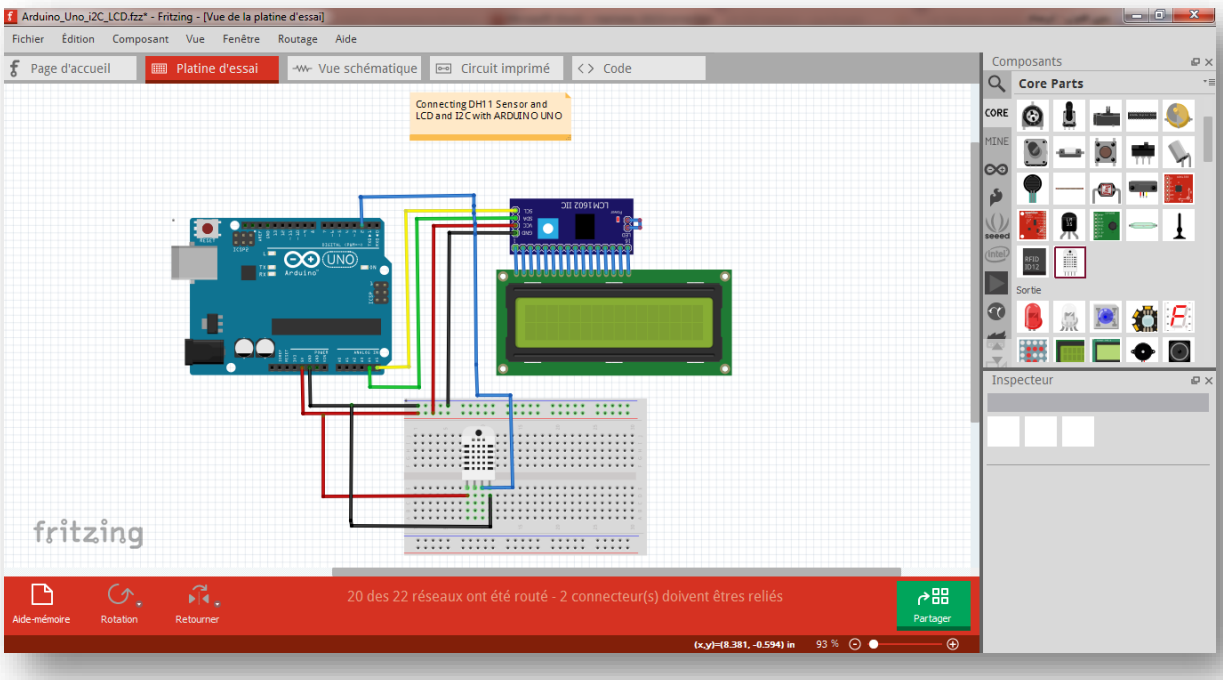
For the Leaking gas alarm, the diagram is as follows.



FigureIII.15: Leaking gas detection system (MQ2)

III.5.3. Humidity and temperature measurement system (DHT11):

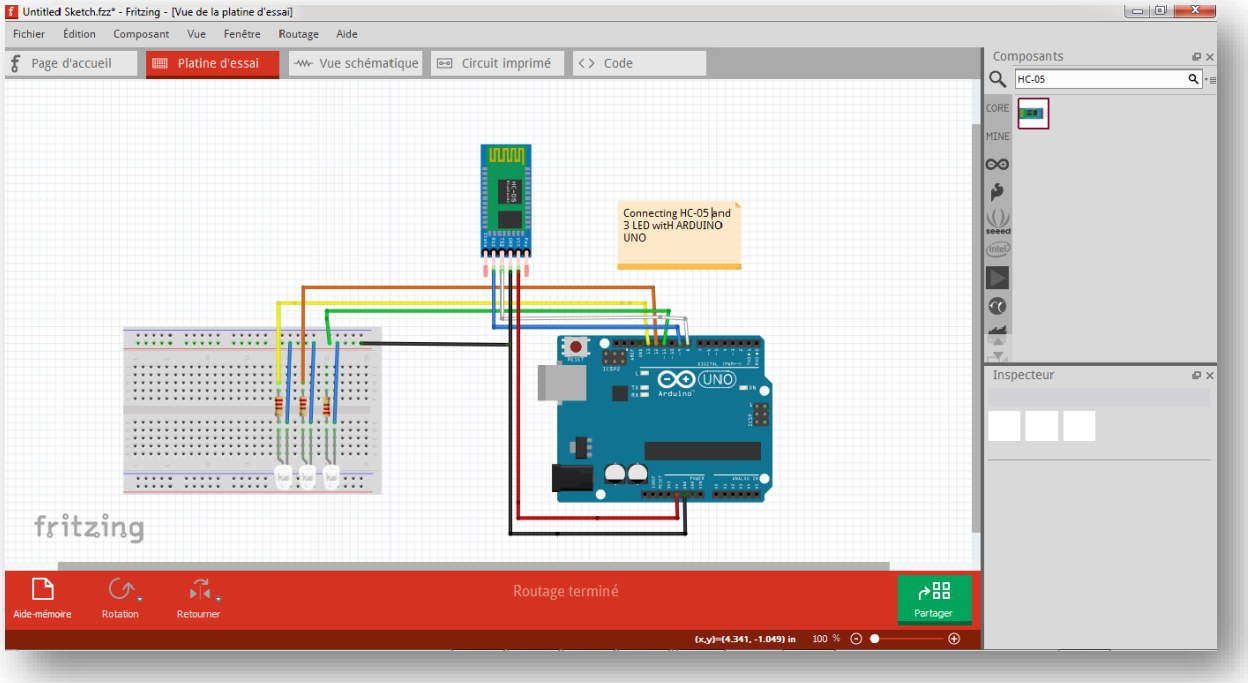
The following figure shows Humidity and temperature measurement system



FigureIII.16:Humidity and temperature measurement system (DHT11)

III.5.4. Lighting

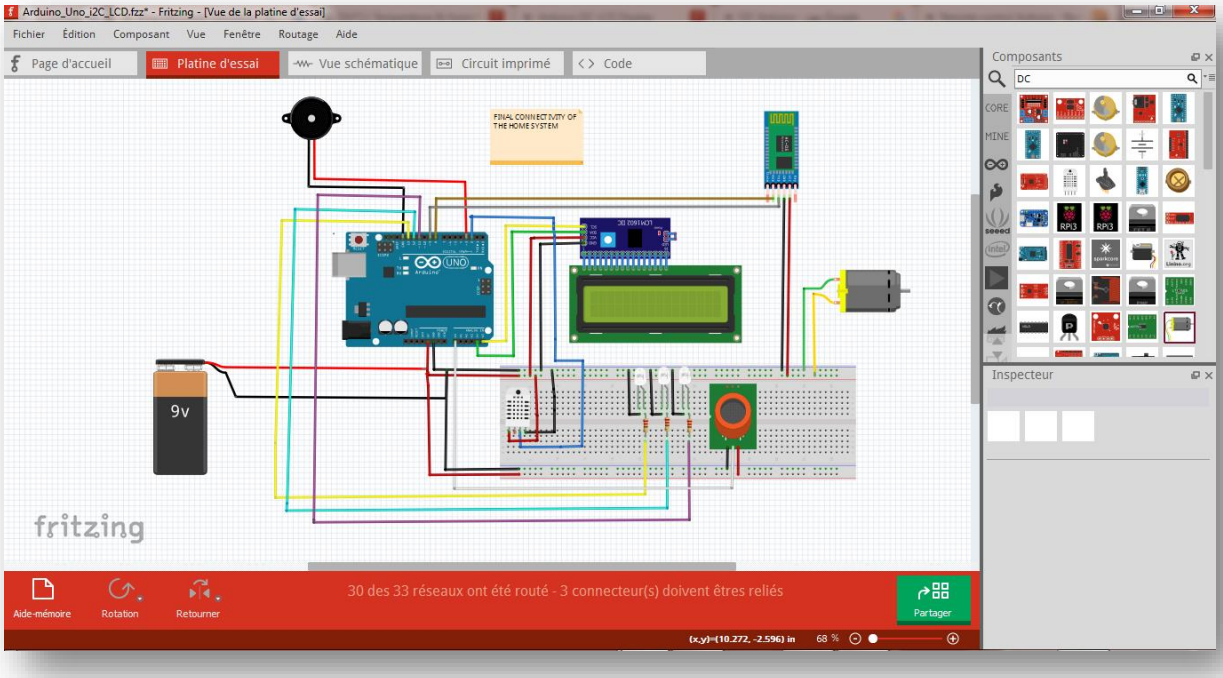
The following figure shows the Bluetoothlighting control chart.



FigureIII.17: Electrical diagram of lighting (HC-05 with LEDs)

III.5.5. The final connections for the home system

This diagram showing the connection of electronic components to our smart home system.



FigureIII.18: The final connections for the home system.

III.6. Design of a home function control software interface:

Lighting control design and garage door via Android application (Remote XY).

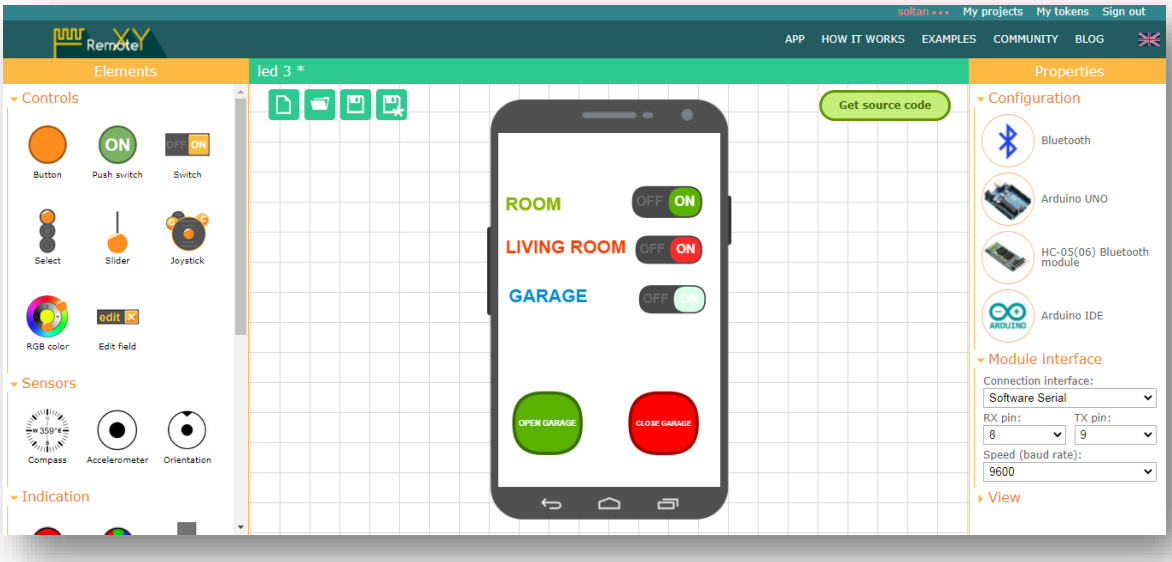


Figure III.19: Design of a home function control software interface

III.7. The last conception of the smart home (Reality) :

III.7.1. Body Part :

Figure III.20 : front side of the house

Figure III.21 :Rear side of the house

Figure III.22 :The side of the house

Figure III.23 :Whole house interior

Figure III.24 :Whole house exterior

III.7.2. Electrical part :

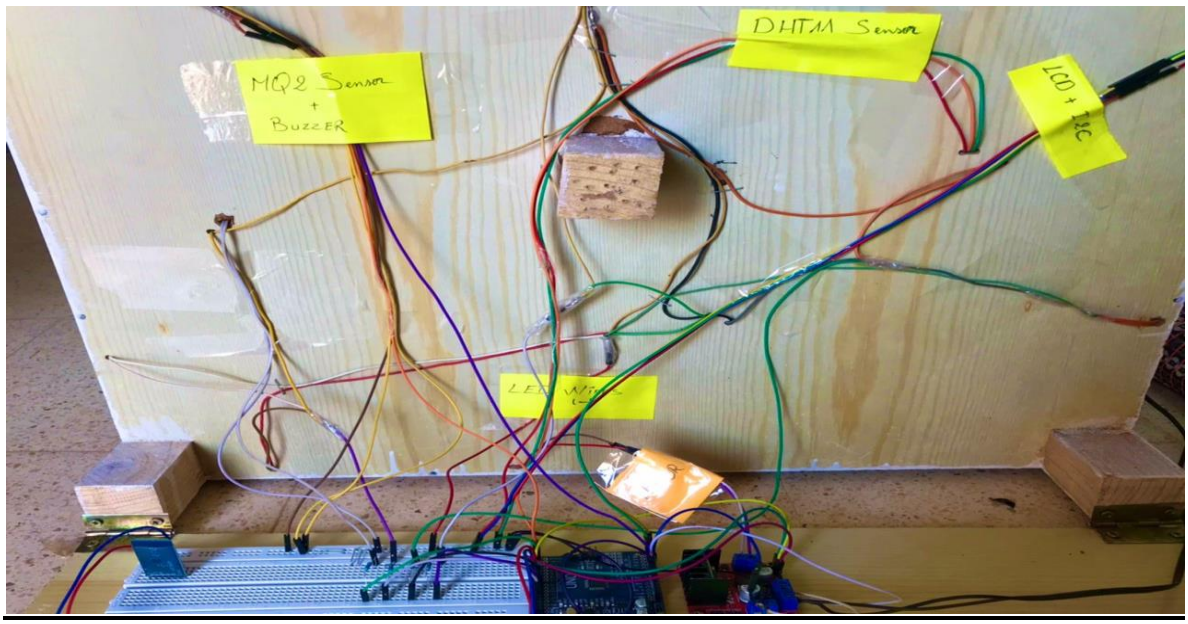


Figure III.25 :Installing sensor wires and other components

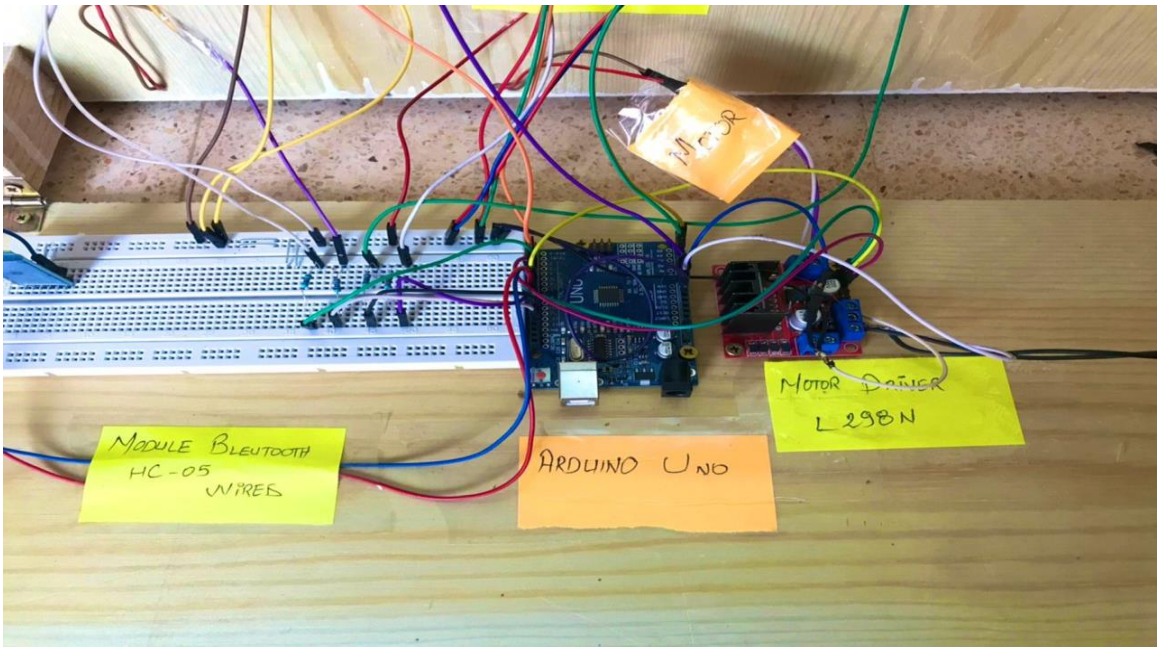


Figure III.26 :Connect the wires to the Arduino and motor driver L298N

III.7.3. Installing and testing sensors and other components at home :

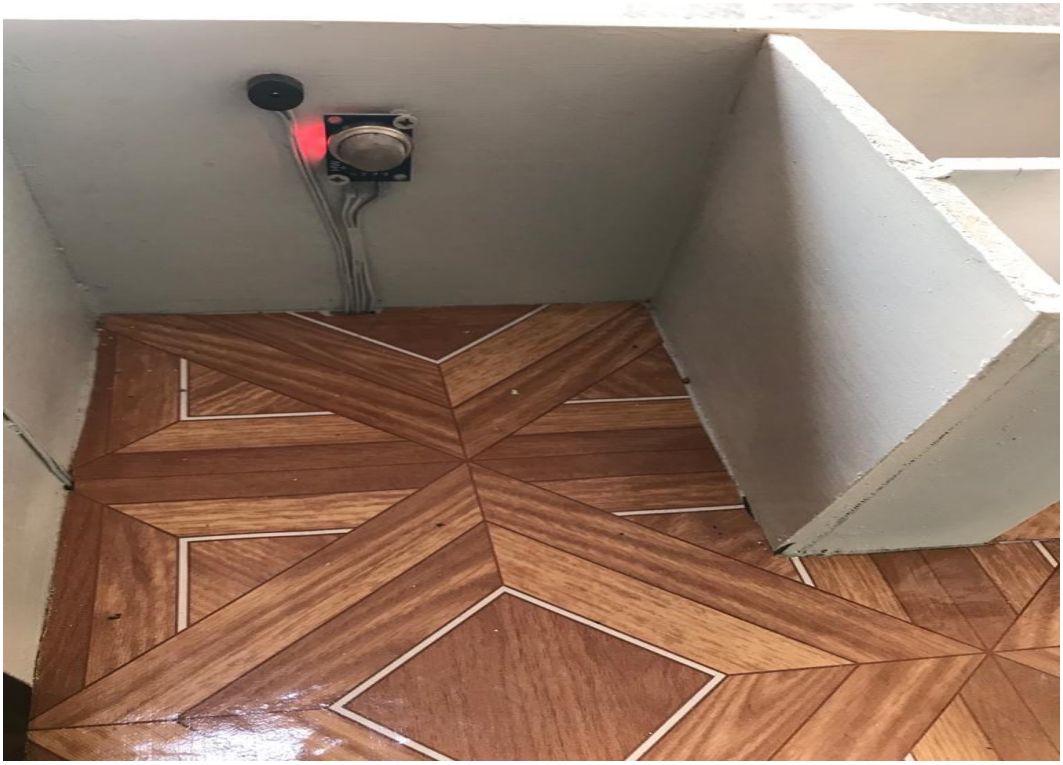


Figure III.27 : installing and testing gas sensor (MQ2)

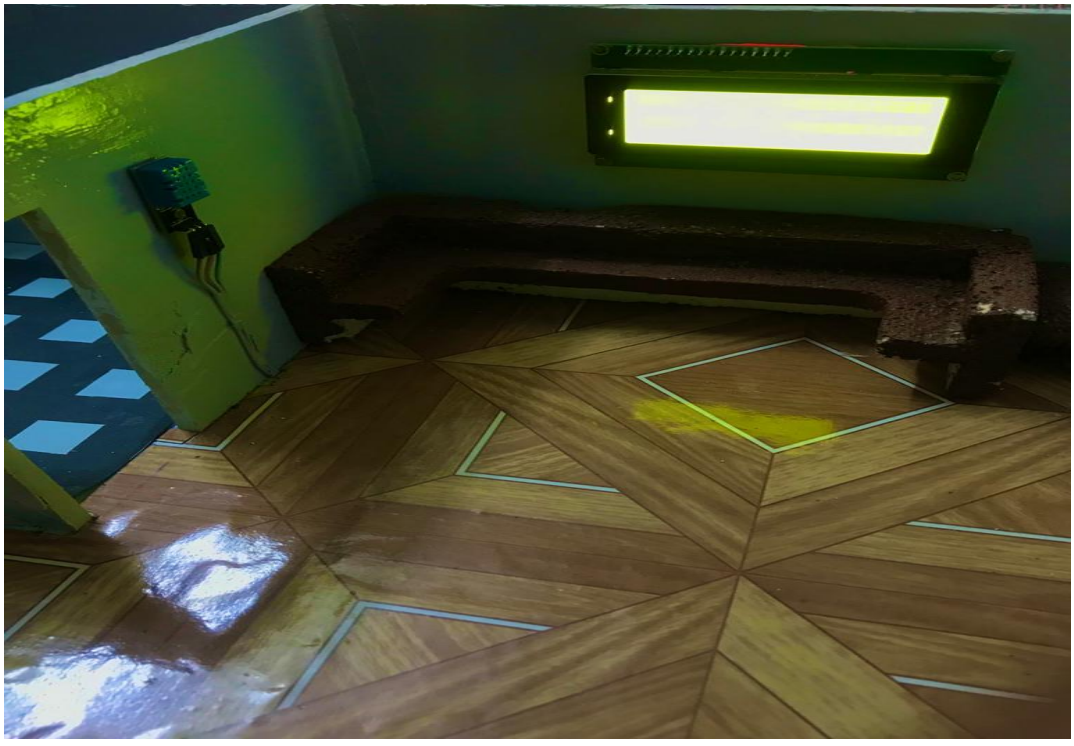


Figure III.28 : installing and testing humidity sensor (DHT11) with LCD

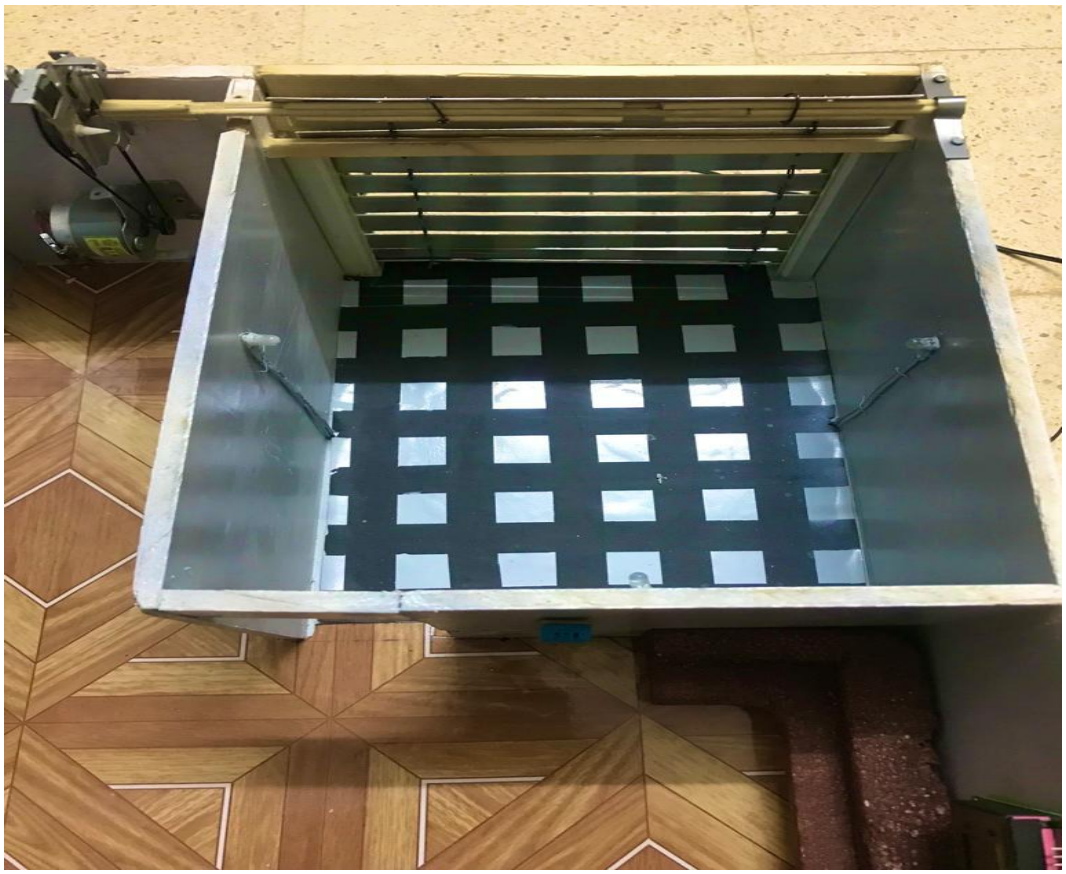


Figure III.29 : installing and testing motor of the garage

Figure III.30 : installing and testing LEDs

Details of implementation of the project. We started by implementing and explaining two applications, the Arduino IDE and Android Remote XY. Next, assemble and program your Arduino gear. We have built a so-called "smart house". In fact, as part of the home automation theme, we designed an automated home. Users can manage lighting and protect their homes through the application. However, features are not limited to these, and other features can be added by a centralized system.

Conclusion:

In this chapter, we have presented in detail the realization of our project. We started with the realization and description of the two applications Arduino IDE and Android Remote XY. Next, the assembly of the Arduino equipment and its programming. We made a so-called "smart home". Indeed, within the framework of the theme of home automation, we designed an automated house. The user is able to manage lighting via the app and to be able to secure the house. However, the features are not limited to these and others maybe added through a system of centralization.

General Conclusion and future works

General Conclusion and future works:

In recent years, computers, electronics and communication technology have undergone a wide development, and have been applied in the design of smart homes, which aims to assist the inhabitant in various domestic situations, guarantee him comfort, improve living conditions and the feeling of security and allows energy saving.

In this context, we tried to develop a home automation system by treating the concept of intelligence in a small space that of the home. A home that allows you to control home devices locally or remotely. For this, we considered the Arduino board used UNO as the brain of the system, we also exploited the Bluetooth communication protocol, which provides the link between the system and the Android application that we created.

Our project aimed to operate some household appliances automatically the lighting inside to control outside, to prevent in case of fire or gas leak, and that allows the opening of the garage remotely as well as to unlock a coded lock or using his Smartphone for more security.

During the implementation of this project, we encountered some difficulties in terms of programming to integrate all the achievements into a single program and in terms of the availability of equipment, but despite this, we were able to achieve the objectives assigned to this project.

The opportunity we were offered to work on this graduation project allowed us to strengthen our ability to work in groups and to enrich our knowledge acquired during the university course as well as the opening to a very promising field, that of home automation and familiarize ourselves with its different applications, which could be very useful in our lives.

In terms of prospects for improvement, several avenues can be considered for greater comfort and safety. We can develop other features and add them to our home automation system such as multimedia management, internal and external monitoring with cameras, an automatic watering system. As we can use the internet to control home automation functions.

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Annexes

Code of the program:

```
#include <SimpleDHT.h>
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
// for DHT11,
//      VCC: 5V or 3V
//      GND: GND
//      DATA: 2
int pinDHT11 = 2;
SimpleDHT11 dht11(pinDHT11);
LiquidCrystal_I2C lcd(0x27, 16, 2);
#define BUZZER_PIN 3
#define REMOTEXY_MODE__SOFTSERIAL
#include <SoftwareSerial.h>
#include <RemoteXY.h>
// RemoteXY connection settings
#define REMOTEXY_SERIAL_RX 8
#define REMOTEXY_SERIAL_TX 9
#define REMOTEXY_SERIAL_SPEED 9600
// RemoteXYconfigurate
#pragma pack(push, 1)
uint8_t RemoteXY_CONF[] =   // 150 bytes
{ 255,5,0,0,0,143,0,16,31,1,2,1,35,15,20,9,119,26,31,31,
  79,78,0,79,70,70,0,129,0,5,18,12,4,105,82,79,79,77,0,2,
  1,35,29,19,8,37,26,31,31,79,78,0,79,70,70,0,2,1,36,45,
  19,8,153,26,31,111,79,78,0,79,70,70,0,129,0,4,31,26,4,50,
  76,73,86,73,78,71,32,82,79,79,77,0,129,0,6,47,24,5,176,87,
  104,105,116,101,32,76,101,100,0,1,2,6,60,20,18,119,31,79,80,69,
  78,32,71,65,82,65,71,69,0,1,2,36,60,20,17,36,31,67,76,79,
  83,69,32,71,65,82,65,71,69,0 };
// this structure defines all the variables and events of your control interface
```

```
struct {
    // input variables
  uint8_t switch_1; // =1 if switch ON and =0 if OFF
  uint8_t switch_2; // =1 if switch ON and =0 if OFF
  uint8_t switch_3; // =1 if switch ON and =0 if OFF
  uint8_t open_g; // =1 if button pressed, else =0
  uint8_t close_g; // =1 if button pressed, else =0
    // other variable
  uint8_t connect_flag;  // =1 if wire connected, else =0
} RemoteXY;
#pragma pack(pop)
/////////////////////////////////////////////
//           END RemoteXY include          //
/////////////////////////////////////////////
#define PIN_SWITCH_1 13
#define PIN_SWITCH_2 12
#define PIN_SWITCH_3 11
int motor1pin1 = 5;
int motor1pin2 = 6;
void setup()
{
RemoteXY_Init ();
pinMode (PIN_SWITCH_1, OUTPUT);
pinMode (PIN_SWITCH_2, OUTPUT);
pinMode (PIN_SWITCH_3, OUTPUT);
pinMode(motor1pin1, OUTPUT);
pinMode(motor1pin2, OUTPUT);
pinMode(10, OUTPUT);
Serial.begin(9600);
pinMode(BUZZER_PIN, OUTPUT);
  //Serial.begin(9600);
  // TODO you setup code
lcd.begin();
  // Turn on the blacklight and print a message.

}
void loop()
{
```

```
// start working...
Serial.println("=================================");
Serial.println("Sample DHT11...");
  // read without samples.
  byte temperature = 0;
  byte humidity = 0;
int err = SimpleDHTErrSuccess;
  if ((err = dht11.read(&temperature, &humidity, NULL)) != SimpleDHTErrSuccess) {
Serial.print("Read DHT11 failed, err=");
Serial.println(err);
delay(0);
    return;
  }
lcd.clear();
lcd.backlight();
lcd.print("tempature  ");
lcd.print((int)temperature);
lcd.setCursor(0, 1);
lcd.print("humidity  ");
lcd.print((int)humidity);
intsensorValue = analogRead(A0);
  //Serial.println(sensorValue);
  if (sensorValue> 200)
  {
analogWrite(BUZZER_PIN, 20);
  }
  else
  {
analogWrite(BUZZER_PIN, 0);
  }
delay(20);
RemoteXY_Handler ();
digitalWrite(PIN_SWITCH_1, (RemoteXY.switch_1==0)?LOW:HIGH);
digitalWrite(PIN_SWITCH_2, (RemoteXY.switch_2==0)?LOW:HIGH);
digitalWrite(PIN_SWITCH_3, (RemoteXY.switch_3==0)?LOW:HIGH);
  // TODO you loop code
  // use the RemoteXY structure for data transfer
  // do not call delay()
```

```
analogWrite(10, 220); //ENB pin
  if (RemoteXY.open_g==1) {
digitalWrite(motor1pin1, HIGH);
digitalWrite(motor1pin2, LOW);
delay(100);
}else {
digitalWrite(motor1pin1, LOW);
digitalWrite(motor1pin2, LOW);
  }

  if (RemoteXY.close_g==1) {
digitalWrite(motor1pin1, LOW);
digitalWrite(motor1pin2, HIGH);
delay(50);
}else {
digitalWrite(motor1pin1, LOW);
digitalWrite(motor1pin2, LOW);
    }
Serial.println(sensorValue);
delay(500);

}
```