

# HOME AUTOMATION SYSTEM



**Fernando Martínez Sidera**  
**Sergio Sanguino Serrano**  
**Borja Yanes Garrido**

## **ABSTRACT**

The main purpose of our project is to develop a scalable house automation system that will be enhanced in the future. In order to achieve that, we have used Bluetooths modules, a Central Android Device, trinket devices, and different kinds of sensors such as humidity, temperature, movement and luminosity. All of these sensors will be together in each room, in what we'll call a sensor box.

We have also created an Android application in charge of displaying the information received from the sensor boxes through Bluetooth.

## **TABLE OF CONTENTS**

[INTRODUCTION](#)

[CONTENTS](#)

[General View](#)

[Components](#)

[Bluetooth Module](#)

[Central Android device](#)

[Temperature/Humidity sensors](#)

[Luminosity sensors](#)

[Movement sensors](#)

[Android app](#)

[SUMMARY](#)

[REFERENCES](#)

## **1. INTRODUCTION**

The idea of this paper is to demonstrate a project undertaken to demonstrate the ability to transfer the current status of our house to our smartphone. This way we would be able to know all the information of our house, like: humidity, temperature, presence of people, etc. all that information will be a click away from anywhere in the world.

When we talk about home automation, we are referring to the use of Information Technology in order to have the whole control of our house. For example, we can control the temperature, amount of light in a room or even the presence of people in the house. Eventually, we would be able to open a window to control the temperature of the house or turn on/off a light if necessary. For these reasons, home automation is a very beneficial system for the owners due to an increase in security and an improvement in the energy efficiency.

Home automation has been related to science fiction for too many years, but that changed when it became a reality since the early 20<sup>th</sup> century. That happened due to the fast growth of information technology and the introduction of electricity inside the houses. Nikola tesla was the first to patent an idea for the remote control of vehicles, and there were other home automation ideas during the World's Fairs in 1930s. The first person who develop a home automation system was an engineer named Jim Sutherland, in 1966. He named the system 'Echo IV', but this project never was commercialized. The change that improved the house automation market was the invention of the microcontroller,

which allowed companies to reduce the electronic cost and adopt remote and intelligent control technologies.

Nowadays, home automation systems are still considered a system focused to rich people, but there are studies that show that 1.5 million of home automation systems were installed in the USA in 2012, and it's going to increase to 8 million in 2017.

## **2. CONTENTS**

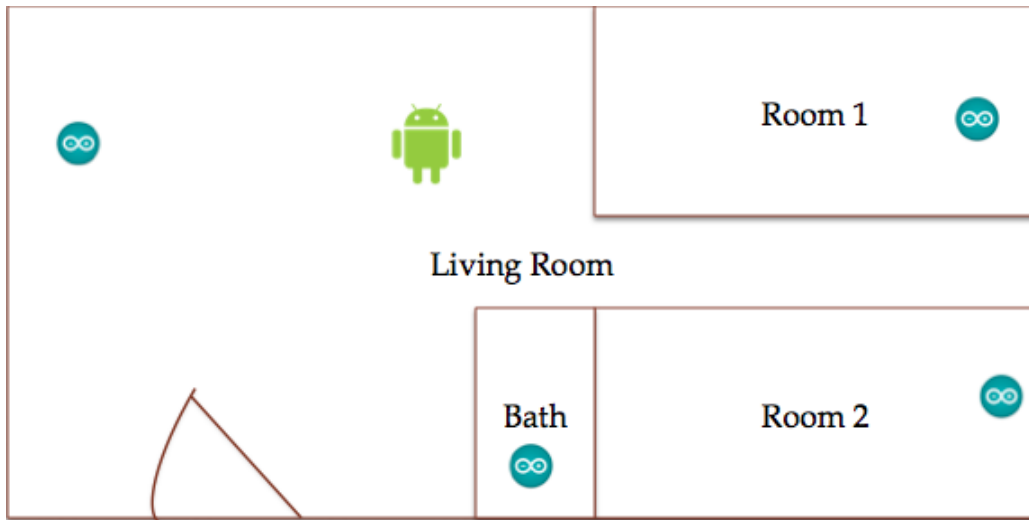
### **a. General View**

Our project of home automation will be able to take measures of different rooms in a house. Each room will have a small box connected to a battery or the electricity. These boxes will be able to measure:

- Temperature
- Humidity
- Movement
- Luminosity

All these boxes will send information to a central Android device. This device will show the values from the different sensors and eventually it will be able to adapt our lights or AC in order to obtain a better energy efficiency.

An initial scheme of the house would be:



As we can see, the sensor boxes (marked in the map with an Arduino logo) would be located in both rooms, the bath and in the kitchen. There would be a constant stream of data towards the central Android device (marked with the Android logo). This communication would be hold through Bluetooth.

At first, our Android device will just be a cell phone. However, our intention is to use a tablet that could be attached to the wall and be used by all the people in the house. But that's not all, our goal is to create an online application that would let us access to the data from all the sensors and being able to turn on/off the lights of the house, or the AC from not only inside the house, but from anywhere in the world. We would just need an Internet connection.

## **b. Components**

To develop this project we have used different kinds of materials:

### *1. Bluetooth Module*

This module is a Bluetooth Serial Link client device which can be connected with any computer or tablet and it seems like is a new serial/COM port. It also has the power to

detect or change the serial baud rate. We have used a total of 4 bluetooths, one per trinket. Each bluetooth is in charge to send a stream of data containing the values of the different sensors. This data is directed towards the central Android device.

## *2. Central Android device*

In the Central Android device is where we store the Android applications to manage the sensors. In a first moment the role of this device is played by an android phone, but the future idea consist in using an Android tablet.

## *3. Temperature/Humidity sensors*

This device uses a capacitive humidity sensor and a thermistor to measure the air of the environment, and it also takes out a digital signal on the data spin. We can read data from this the sensor once every 2 seconds, so the sensors reading can be up to 2 seconds old. We just need to connect the first pin to 5V, the second pin to the data input pin and the last pin is ground.

## *4. Luminosity sensors*

These sensors act as a common resistance. The more light that hits the face of the sensor, the more resistance it will have. The resistance value will vary from 200k $\Omega$  (total dark) to 10k $\Omega$  (10 lux brightness). In addition to this sensor, we will need an extra 10k $\Omega$  resistance from the entry of the trinket to ground.

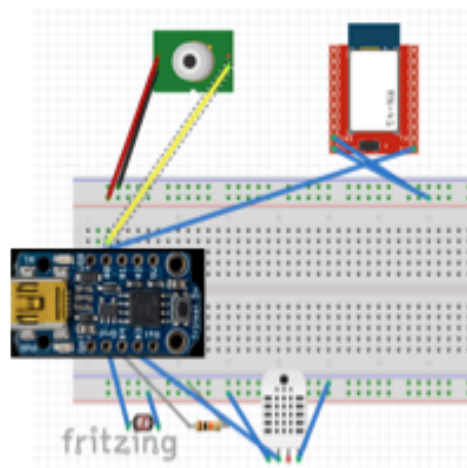
## 5. *Movement sensors*

The movement sensors (or PIR sensors) are capable of detecting movement from 20 feet away. It allows us to insert a duration of the alarm, in order to allow the central device to receive the information. In addition, it has modifiable sensitivity to adjust it to our needs.

### 2.7 *Trinkets*

Trinkets are microcontrollers with 5V voltage and a small memory of 8K flash. It can work at 8 MHz or 16 MHz. It has 5 I/O pins: one for sending info through Bluetooth, other for the temperature and humidity sensor, the third for the luminosity sensor and the fourth for the movement sensor. Therefore, we would still have a free pin that could be used to receive information from the Bluetooth in case we want to interact with the sensor boxes. It uses a mini-USB connection in order to connect to power or to the PC to upload new data.

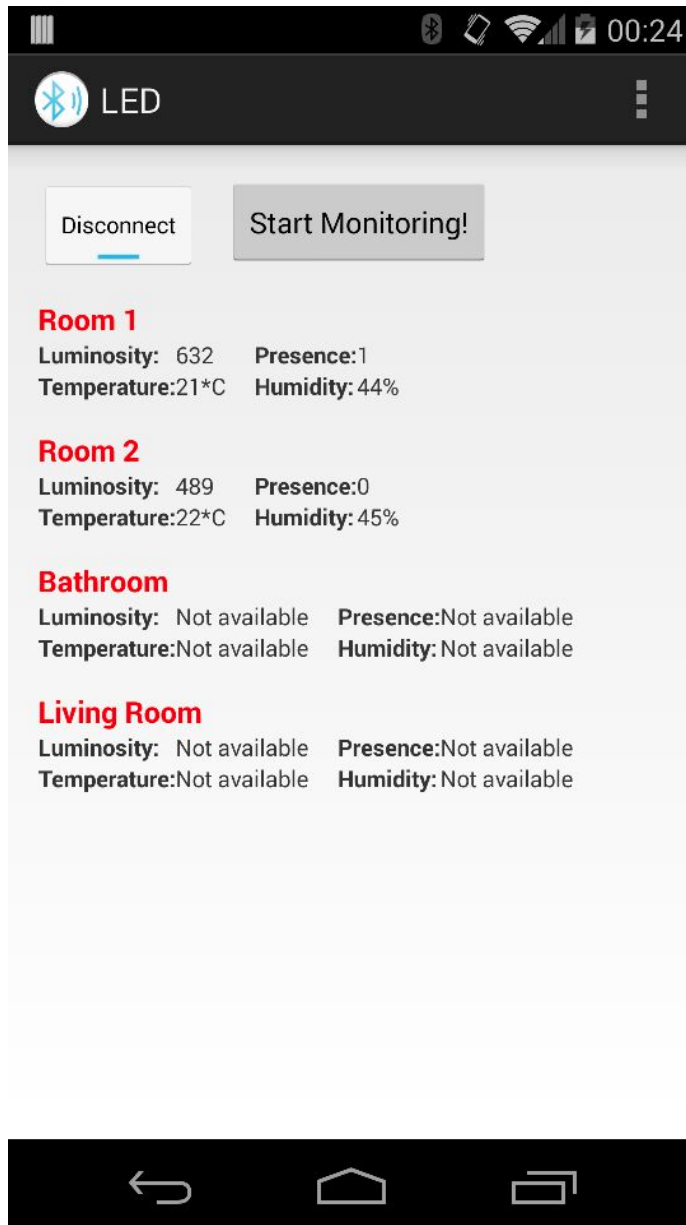
The final result of the association of these components, forming each sensor box, would be:





### c. Android app

The android applications allows us to connect the devices that we have previously paired. It counts with a button to recover data from these devices, and it also initialized a thread per device to keep always reading the bluetooths output associated with each trinket. Finally it shows on the screen the informations that it has recovered.



### **3. SUMMARY**

In conclusion, we have developed a home automation project. It allows us to know the temperature, humidity, luminosity and movement presence in any of the rooms of our house. The result will be displayed in an Android device with the help of Bluetooth modules. This project is not finished yet, and has more future goals:

- Improve the Android app, in order to allow any user to adapt the interface to its particular needs.
- Enrich the response of the application in order to be able to control the lights, the AC and other aspects of the house from the central server.
- Create a web server that allows us to access the data from other devices and include in this server the commands from the previous point.

### **4. REFERENCES**

To develop this project we have used too many internet resources such as:

- <http://www.adafruit.com/products/1588>
- <https://www.adafruit.com/products/385>
- <http://www.adafruit.com/products/161>
- <http://www.adafruit.com/products/189>
- <http://www.adafruit.com/products/1501>
- <http://developer.android.com/index.html>
- <http://stackoverflow.com/>