

AN APPLICATION OF IOT: HOME AUTOMATION

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ABSTRACT

Aim of this Paper basically is to utilize the potential that modern technology possesses by innovating and modernizing a home. This falls under the umbrella of IOT where we arrange several sensors and actuators throughout the house with a central Arduino board that is used for data transmission. This serves the purpose of automating your home by removing unnecessary manual input (Switchboards) and thereby reducing physical strain on the differently abled and the elderly.

The Arduino board is fed real time data from the sensor system which thereupon triggers the relevant outputs through the actuators. For example, a PIR sensor could help detect motion; a smoke sensor to detect fires; a TMP 36 type temperature sensor to detect variations in temperature. This sort of technology can turn a normal home into a fully automated smart home.

Keywords: PIR, IR, IoT, TMP 36 type temperature sensor

1. INTRODUCTION

An inter-connected eco-system made up of several devices that can coordinate with each other via sensors and actuators over shared networks is an all-encompassing definition for Internet of Things (IoT). These systems can automate everyday tasks by utilizing each other's data and functions. As communication technology advances, these sorts of systems gain leaps and bounds in potential. IoT can very well determine our habits and habitats in the near future.

Through the use of this inter connected system, the devices can act on their own via wireless networks by gathering, processing and acting on information. This process is achieved by the system of sensors and actuators that are put in place. As technology progresses, the functionality of these devices does too, resulting in far more complex functions able to be automated. This sort of scope and scalability

makes IoT a very interesting unique field that can revamp our way of living.

2. PROPOSED SYSTEM

Home Automation is minimizing human interaction in regular household tasks with the clever use of technology. The proposed system will be able to automate a home by controlling illumination levels, temperature variations and any utility such as ovens, washing machines, etc. It can also be customized according to the needs of the inhabitants whether to monitor infants or to ensure safety.

Consider sensors like PIR, IR and gas sensors are done using Arduino board, they behave as inputs and when they sense something they intimate the Arduino. So, the inputs for these sensors can be such as movement of door, smoke or light or any electrical device connected to sensor.

Say, when a PIR sensor detect a motion, it consider that something entered the room and it intimate the Arduino to turn on the light in the room. Other devices also work in such manner.

3. COMPUTER HARWARE AND SOFTWARE IN IOT

Internet of things is a field that aims to affect the physical world in real time which necessitates the use of both hardware and software components.

HARDWARE

Hardware is an important part of IoT since it interacts with the physical world primarily. It includes but is not limited to sensors, actuators, microcontrollers, remotes, bridges, power supply, etc. It performs several functions but mainly is responsible for collecting information, relaying information and acting on information. The system's monetary investment is mainly decided by the hardware as is the quality and efficiency of the automation experience.

SENSORS AND ACTUATORS

Sensors are a vital part of any automation system or IoT. It is a device that reacts to its surroundings and gathers relevant data. It can detect variation in motion, position, illumination, temperature, sound, etc. They are akin to human sense organs (Ears, etc.) in that they gather data and send it to a central hub for processing.

An actuator is akin to human limbs in that it is the tool through which we act and create an effect on the environment around us. It requires a control signal that signifies what action it needs to take and a form of power supply. They contain communication equipment along with the necessary power source.

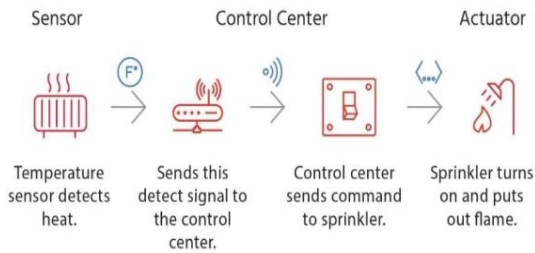


Fig 1. Sensor to Actuator Flow

Microcontrollers are as the name suggests, miniature versions of computers that are self-sustainable. They are custom made to function in a specific system in a specific way. Like any computer, they have onboard volatile memory and other serial ports, timers, counters, etc. They are the middlemen for connectivity, control and communication



Fig 2. Microcontrollers

They see widespread use in a variety of fields due to their customizability. The type is selected based on

project requisites such as power consumption, connection oriented, security oriented, etc.

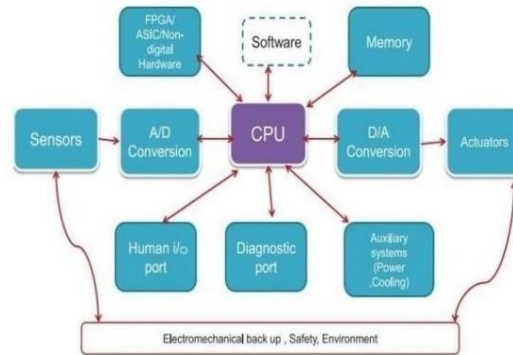


Fig 3. Generic Embedded System Architecture

3.1.3 FIELD PROGRAMMABLE GATE ARRAY (FPGA)

FPGAs are semiconductor integrated circuits that can be customized into performing any function that is required. This is due to their circuit being built upon configurable logic blocks which contain at the very least a couple thousand logic gates and can even go upwards of ten lakhs.

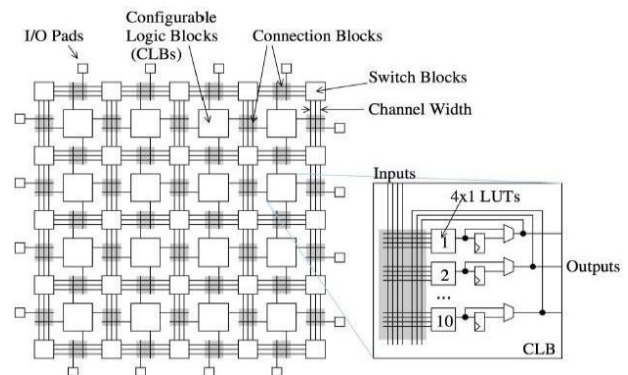


Fig 4. FPGA

SOFTWARE

Several different types of components make up IoT software ranging from embedded systems to

middleware. This fragmented yet cohesive unit of applications gather the data from all the sensors, synthesize said data and analyze it.

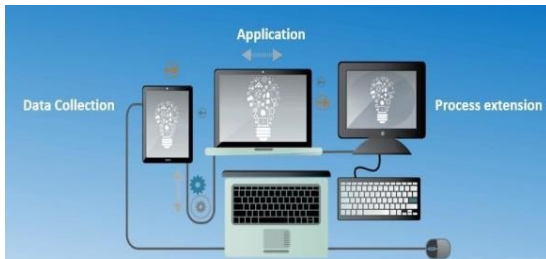


Fig 5. IoT Software

DATA COLLECTION

This software is the managing unit for all the data being collected and sent by the various sensors. It collects said data, makes sure the sensors are responding favorably through carefully chosen protocols and is even responsible for dispensing this data to other devices when necessary. It connects and uploads this data directly to the central hub where analysis takes place.

DEVICE INTEGRATION

IoT is by definition an integrated hub of devices and networks all working together to achieve common goals. Such an integrated hub needs to be efficiently managed and that is where device integration comes in. These applications understand the limitation of each device and network utilizing them to their fullest potential without overloading them. They are the key component when it comes to performance of an IoT product.

REAL-TIME ANALYTICS

Raw data is hard to interpret on its own. Real time analytics turns these elusive blocks of data into patterns recognizable by humans or other contextual actions. They analyze data from various sources based on their context and environment in order to efficiently achieve the system's goal of automation.

4. WORKING OF THIS PAPER

The basic idea or the logic behind this that is that the sensors detect movement from the real world and to pass it to the Arduino board and trigger other devices

based on it. We have used some sensors like PIR , gas etc and they acts a s input which are connected to Arduino via jumper wires and they act as input and the outputs are the act of other devices.

Say, when a PIR sensor detect a motion, it consider that something entered the room and it intimate the Arduino to turn on the light in the room. Other devices also work in such manner.

Say a smoke sensor , when it detect smoke in the house above a certain level and it sends the signal to Arduino and the Arduino sends a signal to led blinker to alert the people.

If we take the temperature sensor into consideration whenever the sensor detects the temperature is more it tells us that temperature is more than normal temp so it switches on the ac or fan connected to it at output side. For ultrasonic sensor when it detect something a distance it tells us how far the object is from the sensor. So when it detect something at a distance , it helps them opening the door if not it keeps the door closed. For Keypad lock system its working is basically on two things if the given password matches the original password or not. If it matches to the password which was set prior to its use then the door will open((if the actuator is a motor and its connected to door) in our case we used a micro-servo motor or else it doesn't do anything.

ADVANTAGES OF INTERNET OF THINGS

Some advantages of Internet of things are:

- Automation and Control
- Efficient Resource utilization is possible
- Minimizing time and human effort are also reduced
- Enhancing data collection
- Improving Security

DISADVANTAGES

Some disadvantages of Internet of things are:

- Compatibility
- Complex
- Privacy and Security concerns
- Safety issues for the users

CONCLUSION

Internet of Things has emerged as a leading technology around the world. It has gained a lot of popularity in lesser time. Also, the advancements in

Artificial Intelligence and Machine Learning have made the automation of IoT devices easy. Basically, AI and ML programs are combined with IoT devices to give them proper automation. Due to this, IoT has also expanded its area of application in various sectors like:

1. Healthcare
2. Agriculture
3. Automotive Industry

But when we talk about IOT in home sector his concept can be aptly incorporated to make it smarter, safer and automated. This IoT project focuses on building a smart wireless home security system which sends alerts to the owner by using Internet in case of any trespass ad raises an alarm optionally. Besides, the same can also be utilized for home automation by making use of the same set of sensors. The leverage obtained by preferring this system over the similar kinds of existing systems is that the alerts and the status sent by the wi-fi connected microcontroller managed system can be received by the user on his phone from any distance irrespective of whether his mobile phone is connected to the internet.

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