A Smart University Building Based on Artificial

Intelligence and the Internet of Things

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Abstract— In this paper we designed system for smart university building based on artificial intelligence (AI) and internet of things (IOT). Our idea can be summarized in smart security system that has different sensors to detect the surrounding environment of the class room in campus which keep everyone and everything on campus safer. By using (IOT), (AI) technologies and applications and by using microcontroller programming we can make the university building safer, secure and more energy saves.

Keywords—Internet of things; Artificial Intelligence; Smart University; Microcontroller; Smart buildings.

I. INTRODUCTION

By designing a smart university building, we can keep the campus more safe and secure. We can keep update so we can always be ready in case of emergency situation. You can use the same common technology platform to deliver new applications that make your campus much more efficient. Moreover, you can create a smart environment that secures students, faculty and researchers [1], [2] and [3].

It is necessary to note that school safety and school life safety are not merely reactive steps that must be enforced for the purpose of compliance. It is important to comply with the current requirements, but there are also additional ways that protection can benefit you. Better manage your campus, such as being able to control open and close doors of classes, control access to specific areas and control the light of the class rooms also giving alert when any permeation happened after the working hours. Security also adds value, for the pupils themselves and for their parents, who will gain peace of mind knowing their sons are in a safe, security-aware environment [4].

II. INTERNET OF THINGS

From smart tools to smart homes and cities, we have now managed to integrate everything around us into our smart devices to control everything that matters to us as individuals,

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such as shutting down the oven rather than going home, avoiding the heart attack caused by the panic of forgetting simple things. First, what is the internet of things, and where is the future?

Internet based objects are a concept that includes everyday new objects, from industrial machines to wearable devices. Using integrated sensors for data gathering, data is taken over the Internet. Sensors are used to automatically control the process of heating and lighting or alert maintenance personnel with equipment Production in cases of emergency failure. Internet of things is the future of technology that can make our lives more safe and effective [5].

Only a few years have passed when we have seen the real potential of the Internet. The concept of wireless Internet development has become everywhere used, the integrated sensors have evolved terribly, and people have begun to understand technology that can be both personal and professional.

The term "Internet of Things" was announced in late 1990 by business man Kevin Ashton. He was a member of the team who connected things over the Internet. He said that he used the term Internet for the first time in his presentation in 1999 [6].

III. MICROCONTROLLER

A microcontroller on a single integrated circuit is a small device. It is a scheme on a chip in the new terminology. One or more CPUs along with memory and programmable peripheral input/output are included in a microcontroller [7]. Program memory is also often neither included on the chip in the form of Ferroelectric RAM, NOR flash or OTP ROM, as well as a limited amount of RAM. It has several applications, This includes vehicle engine control systems, implantable medical equipment, remote sensing systems, office computers, appliances, power tools, toys and other embedded systems. Compared to a microprocessor, the microcontroller

is limited in size and much cheaper[8]. Mixed signal microcontrollers are prevalent; they incorporate the analog

components required to monitor electronic systems that are not digital. Some microcontrollers can use four bit words and, for low power consumption, operate at frequencies as low as 4 kHz. The first microprocessor was the Intel 4004 4-bit, released in 1971, with later access to the Intel 8008 and other more capable microprocessors [9].

The flow chart which is responsible for synchronization between the Android application and our project is shown below in Figure 1:



Figure 1: Flow chart of the system

Here we have to run the project after that, the sensors send their readings to the Arduino memory, and ESP has access to read this information from the memory so that we can see it in the application associated with ESP.

IV. OBJECTIVE

The main objective of this work is to:

- 1- Design and implement an intelligent security system which provides safety and security services to help in protecting working staff, students, campus facilities, providing simple management access and easy control in different things like locks of the class doors, light and giving alert when any permeation happened after the working hours. Motion detectors identify movement at a place and time where no one should be.
- 2- To use technology IOT protocol by an Arduino mega, Nude MCU, RTC, LDR, PIR and other components.
- 3- To link programming and its practicality to improve the security systems and provide more safety in campus.

V. RESULTS

After many attempts, we were able to make Prototype with lowest costs and with high quality that contains all the parts used in order to perform it's function.

Finally, we obtained a safe and economical system in terms of partial protection on campus, and it reduces the effort exerted by university security and also saves electricity.

We divided this system into two systems:

1. System that works in teaching period:

We got an automated system that monitors standard conditions inside the room for classrooms such as temperature, humidity, light and movement.

If the temperature is lowered, the ac system will work automatically, as if the light is dimmed, the light will turn on automatically.

This system has been linked to the Internet and has been linked to Internet of Things applications for control and monitoring of the classroom.

Figure 2 shows the system functioning at teaching period.



Figure 2: System at teaching period

2. System that works outside the teaching period:

This system is designed to increase the level of protection on university.

We connected the motion sensor inside classes to detect the motion. The results were wonderful.

The system works automatically. As soon as it detects any motion it closes the door and confirms it. It also performs the control of operation of the light systems. It sends a warning to control unit in order to activate the protection protocols established by the university.

In the following figures 3 and 4, the motion sensor worked when entering the classroom and gave an alarm in addition to turning on the lights.



Figure 3: Turn on the light



Figure 4: Motion alert

We separated the two systems using RTC. Both systems are connected to the Internet to send data and control the system remotely through the Internet of things. At any time we can examine the two systems and directly control the systems via an Android application which is connected to the system.

Figure 5 shows the initiation of the Blynk system control process:



Figure 5: System control

In figure 6, the door is closed normally while in figure 7 the door is opened by the control system.



Figure 6: Door is closed



Figure 7: Opened door



Figure 8: Open door by Blynk

Figure 8 shows the door opened by Blynk

Figure 9 shows the process of controlling the fan by the Blynk program.

Figures 10 and 11 show the fan in an on / off state.



Figure 9: Controlling the fan



Figure 10: Fan off



Figure 11: Fan on

The following figure shows the process of controlling the light by the Blynk program



Figure 12: Controlling the light

Figures 13 and 14 show the lighting in the classroom being switched off and on.



Figure 13: Light turn off



Figure 14: Light turn on

VI. CONCLUSION

This paper presents a low cost and flexible solution for smart university building. Different applications in classroom are controlled by mobile phone applications. We developed a system suitable for smart building by using arduino and IoT technologies.

The system allows controlling different applications in real time monitoring, motion sensing. The system reduces human intervention by making automated system. It can be used for controlling and monitoring the different domestic applications. This system also reduces consumption of electricity in the university. The system response is good and sustainable for long time operation. It can be used in many places like Banks, homes, hospitals, labs for saving energy.

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