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Smart building using IoT

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Abstract---With the growing urbanization that is taking place in every major city in the world, most people are opting to relocate to communities without gates. Therefore, there is a need to develop an android app that will monitor people's activities and times so as to give them safety in this fast-altering world. This application will keep track of all the activities happening in the building and will also make daily activities easy and fast such as by providing guest code verification, daily helps registration, parcel monitoring and etc. In today's technology department, the user expects automation that makes a particular task easier, safer and more effective. The idea is to upgrade our old-style garden irrigation structure to an automatic intelligent system by means of Internet of Things (IoT) features. In this program, we have used a soil moisture sensor, a temperature sensor and a moisture sensor installed in the root zone. We have proposed to create an application that will send a notification about fraud at the gate and the owner will inspect it. The automation of garden irrigation will be supervised by a public guard and secretary.

Keywords---Android Application, Security, Smart Automated System, Soil Moisture Sensor, Temperature Sensor, Humidity Sensor, Internet of Things.

Introduction

The Internet of Things, or IoT, may be a structure of related computer systems, machinery also digital devices, things, creatures or individuals providing through unique identifiers (UIDs) and, as a result, the capability to send information across the network without the necessity for interpersonal or interaction computer. The IoT ecosystem consists of smart web-enabled devices that use embedded systems, such as processors, sensors, and computer systems, to gather, communicate and process information from their locations. Sensor data is shared between IoT devices and IoT port or other peripheral device, which is sent to the cloud for analysis or localization. These gadgets occasionally talk to each other and act on the information they share. People may not be able to engage with devices, such as line them up, give them directions, or access information, because they accomplish a lot of work without human participation.

Over the decades, gardening has been popular in many regions of the world, owing in part to a series of garden exhibits held in a few cities. However, because most individuals live in residential areas, there are significant blockades and limits for individuals to nurture their outdoor greens near their homes, just as most individuals do not have considerable time to seek care. in their garden. As a result, enclosed farming has been investigated for a variety of ecological and social benefits in this situation. People are progressively looking for a way to have fun and enjoy themselves these days. many of us want to continuously grow organic home plants for health and wellbeing. Many of them, however, do not have the time to care for the plants, and without much expertise and farming experience, cultivating and maintaining a garden in such a condition is difficult, especially for older people with physical limitations. The IoT Backyard was designed as a result to track and control water in ground-based plants.

Security on gate networks is a major problem and the difficulty that people need to consider today. Perhaps the most well-known problems considered via the protector and administrator are keeping records, authentication and verification of day-to-day records. Intelligent structures integrate electrical objects and networks to detect environmental variations associated with a building function. Intel's Building Management Platform (BMP), as well as specialist magazines and existing periodicals, have all emerged in recent years as smart building management solutions.

IoT's automatic gardening system built on Arduino UNO connected with sensory pH and soil moisture YL-69. The IoT server receives this dual sensor information and transmits it as a message to farmers. The owner / growers can set very low and low prices for irrigation. With the assistance of this application, it will be easier for the administrator to perform his responsibilities. This process includes the SMS feature to notify the client of violations and for the purpose of communicating and using GPS tracking of the client. Therefore, during this project, we will be relying on Internet of Things (IoT).

Literature survey

The proposed concept is used in the open-source platform Android, which is the best for the modern IoT platform. The main advantage of our ES3B system is that it uses available, readily available technologies, namely, smart phone, cloud, and IoT. The system is intended to make building operations easier while also increasing security. [1]. Their mission is to improve people's standard of living at home and at work by developing new better workstations in which the entire system is automated, efficient, and controlled by the user via his smartphone or computer, while keeping costs within the typical person's budget. All of this is done with the installation of IoT, mist and clouds. The simulation is carried out utilising open-source hardware and software in an outstanding and intelligent manner, without jeopardising the QoS (Service Quality) of any feature provided by other existing solutions. [2].

Their framework uses Cloud Computing capabilities to enable integration in SB and at the same time, energy saving. The framework was tested in a real state, had a positive response regarding the communication from the cloud and the structure itself. Local laws were used to assess real-time situations where communications were at risk [3]. The power of an intelligent home gardening system that blends gardening activities with IoT technology is examined in this study. They talked about how IoT technology can be integrated into gardening practices at home as part of a smart program. Although there appear to be many automated house concepts, as this article has addressed, there is indeed potential for advancement in IoT technology. [4].

This paper automatically talks about garden plans using IoT. They monitor natural conditions such as soil moisture, and temperature and take the right path toward the problem. We employ algorithms based on the data obtained to assist keep the garden in excellent condition while also utilising resources efficiently [5]. Smart City technology encourages cloud-based and Internet of Things (IoT) support services that employ smart phones, sensors, and RFIDs to connect real-world users. This paper emphasizes on the features of the cloud-based deployment of intelligent cities and the validation of the capabilities of a platform designed for IoT functionality using cloud middleware [6].

The persistence of this paper is to deliver a summary of the literature on how intelligent structures work and how they can be used to manage a variety of objects in a built environment. This paper will focus on the concept of smart building, energy management, spatial comfort, heating, ventilation, and air conditioning planning, as well as visualization using Building Information Modeling (BIM) as one of the means of sharing and exchanging buildings. information, as determined by book reviews. Many aspects of smart buildings have to be met to fit the context of a smart city [7]. The goal of this article was to conduct a comprehensive investigation of IoT-enabled resources in intelligent buildings. According to the evaluation, it is a relatively new study topic, and based on the increasing number of publications recently published, it is now in the hype category [8].

With the advancement of sensory technology, the system can be taken to the next level, allowing consumers to get the most out of their investments. If soil nutrient sensors are connected, the system can be customized to provide a direct delivery of fertilizer to the garden. This process saves employees once and for all makes good use of existing water resources, leading to increased profits. Program ideas will help improve investment strategies and implementation [9]. In 2019 that security in gated networks is becoming a major worry and an issue that has to be addressed by people today. DiGinty is an Intelligent Security Management System that automatically performs human tasks at large gates. The framework aims to improve security by providing a request for assistance with capturing customer information, archiving records, and conducting analysis, which would be done in person. The framework will be in line with the client's wishes to reduce the time required for departments to capture all the information by staying easy to use[10].

It is recommended that Wireless Sensor Network (WSN)-enabled Global Sensing cut crosswise through several zones of contemporary life. In this system, it utilizes a dirt wetness identifier, a temperature finder, and a moistness locator situated in the plant's root system in this framework. The framework sends the qualities it perceives to the base station. The objective is to utilize WIFI to get information and sync it with the web. Whenever the water level falls beneath the foreordained point, the client is advised. This paper exhibits how, with the assistance of the NodeMCU, we can do remote circuit chart perception and show the outcomes utilizing the Blynk App. Whenever it detects low dampness and a warm temperature, a message is sent among NodeMCU and Blynk App, and the engine is promptly begun in-home cultivating, cultivating, and different applications [11]. In 2018 the Internet of Things Technology is being used to build this system. The paper presents the explanation, improvement, and results of an undertaking to utilize sensors in an average condo to screen the circumstances in the loft utilizing IoT innovations are introduced in this paper. The sensor arrangement and area are given, trailed by a conversation of the sensors utilized, as well as the remote connection points and cloud advances utilized. The undertaking results are accounted for in light of the utilization of Bluemix with Node-Red [12].

In 2018 proposed that many individuals are now demanding to cultivate their own organic cultivated plants for grounds of health and safety. Subsequently, this undertaking presents an Internet of Things Backyard framework as a cultivating apparatus for observing and controlling local plant water systems. It centers around soilbased plants with a water container and tap and uses the Internet of Things (IoT) and minimal expense advances. There are three pieces to the system:(1) Node MCU V3 (2) Firebase System (3) IoT Backyard Application [13]. In 2019 proposed a system based on Realtime Database for IOT Home automation & Energy Monitoring App. In this paper, it will utilize an ongoing information base engineering to make a versatile application for home mechanization and energy observing that depends on the Internet of Things. Different parts to build it will be incorporated too, for example, plan convention information, continuous data set utilization, information recovery and posthandling, and connection point with the portable application. They have delivered an IDE to make the actual application to foster it. The second is a constant data set, and the continuous data set utilized

in this study is Google's Firebase information base, which is adaptable and has SDK support. At long last, the POJO (Plain Old Java Object) Model is utilized to oversee information recovery, composting, refreshing, and eliminating procedures on the application side [14,15] .

System Methodology

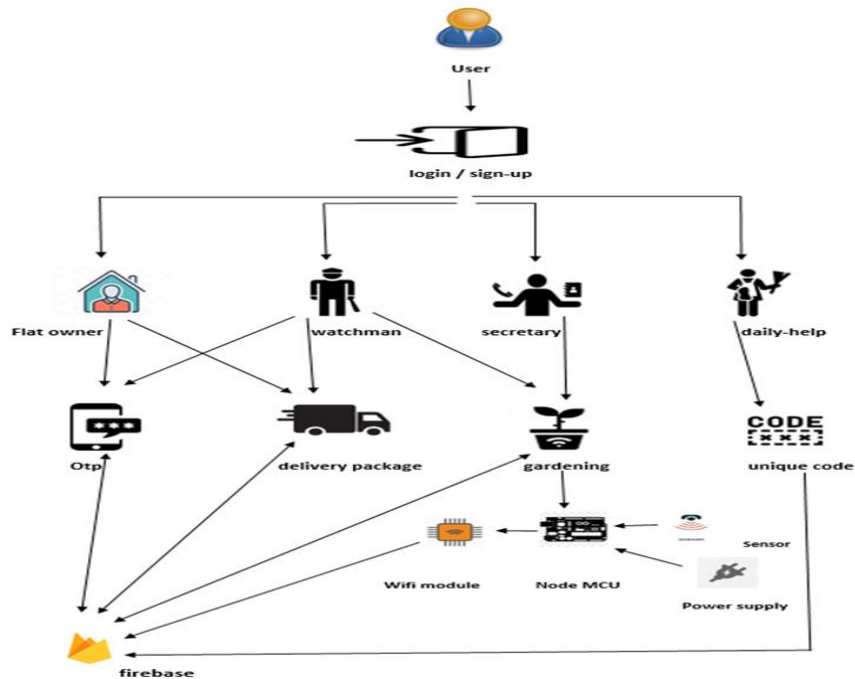


Figure 1. Proposed System

In this system we use Arduino microcontroller, soil moisture sensor, Temperature sensor and motor pump. The motor pump will get switched ON/OFF depending upon the soil moisture condition and the status of the same can be displayed on App. The temperature is also identified using temperature sensor which is connected to microcontroller. When Soil moisture sensor value is low and temperature sensor value is high then it sends notification to the Owner on the Mobile Application.

The mobile application also provides features like easy access for guests to enter the society through One Time Password generated by the user via the app. The application also enables essential people like household helpers, dairy – men, laundry servicemen to enter the premises with the help of the same OTP System. The profiles of the above mentioned would be created well in hand as and when they are hired for the services. The records of these people would be stored in the database which can be viewed in the mobile application.

Online deliveries also can be scheduled by the user so that the delivery men can leave their packages at the security center and can be collected by the security man on behalf.

Algorithm for our System Methodology

Step1: Login
 Step2: If new user then signup
 Step3: After authentication, the user will select who he/she is from the options: Watchman, Secretary, Flat Owner, Daily Help.
 Step4: If Flat Owner.
 Step4.1: Generate OTP for Guest Arrival.
 Step4.2: Add delivery details.
 Step5: If Secretary.
 Step5.1: Check Daily Help profile.
 Step5.2: Monitor Gardening System.
 Step5.2.1: Check Soil moisture level, temperature value from sensor.
 Step5.2.2: If the values are below threshold values, then it will switch on the motor.
 Step5.2.3: Once threshold values are attained, motor will be switched off.
 Step6: Daily Help.
 Step6.1: Create Profile.
 Step6.2: Will generate a unique Code.
 Step7: If Watchman.
 Step7.1: Authenticate OTP of Guest/Daily Help.
 Step7.2: Monitor Gardening System.
 Step7.2.1: Check Soil moisture level, temperature value from sensor.
 Step7.2.2: If the values are below threshold values, then it will switch on the motor.
 Step7.2.3: Once threshold values are attained, motor will be switched off.
 Step7.3: It will check delivery details entered by the flat owner.
 Step8: End

Results and Discussions

In this section we will discuss results achieved through our system and demonstration of the same. This system is implemented in android studio. We had used firebase database service provided by google.

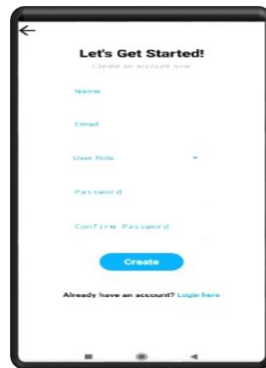


Figure 2. Sign Up page

Figure 2 shows Signup Page, where user can create his profile if he/she is new to the application. While creating user can select his role. User should set a password for his profile which we used while Login process. This all information entered by user are stored in firebase database.

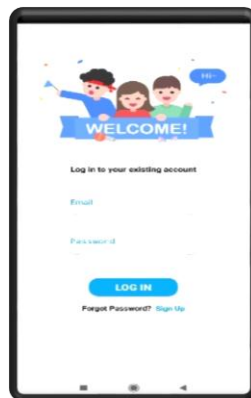


Figure 3. Login Page

After user has created his/her account the user will be directed to this Log In page. This page will perform user authentication of the email and password entered by user while creating account. This page also provides a Forgot password feature in case if user does not remember his **password**, then he/she can use this feature.

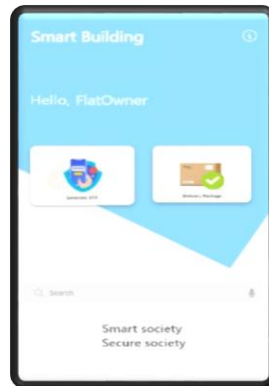


Figure 4. Home Page for Flat Owner

This is home page for flat owner activity. Flat owner has 2 activities: Generate OTP for guest and Delivery Package. Generate OTP feature will be used by flat owner if any guests are coming to his/her house. If there is any package to be delivered at flat owner house then he can update to watchman using Delivery package feature.

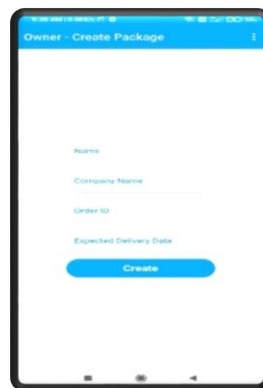


Figure 5. Create Package

This is the Delivery page of the application, here the user will enter the details of the parcel which will be coming to his/her house, including the date and name of company.



Figure 6. OTP Generation

This is the OTP generation page, on this page the flat owner will enter the phone number of the guest coming to his house and an OTP will be send on that number. Once the OTP is received on guest's phone, then guest can just tell the OTP to watchman and they can enter the society.

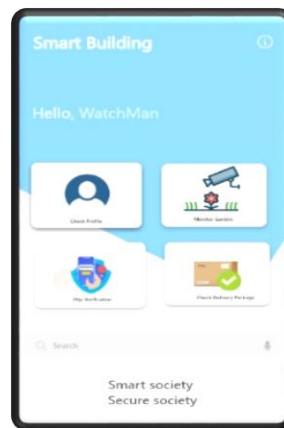


Figure 7. Homepage for Watchman

This is Watchman page; it includes the features of the watchman. Watchman must monitor the garden where he can see all the values from the sensors and he/she can switch oof/on the motor using this feature. In OTP verification, watchman has to just enter the code.

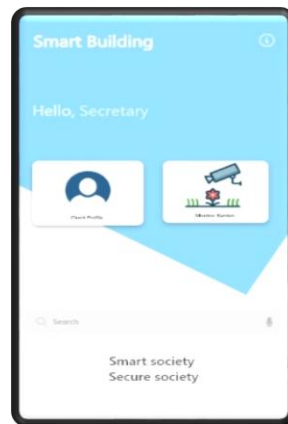


Figure 8. Homepage for Secretary

This is Secretary page; it includes the features of the secretary such as to monitor garden and to check profile of the daily helps which have registered.

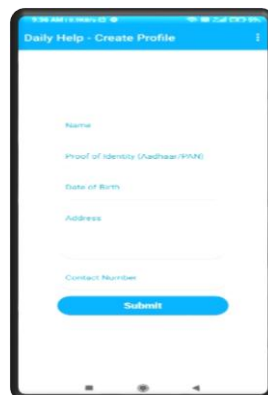


Figure 9. Homepage for Daily Help

This is daily help activity, where a daily help profile can be created.

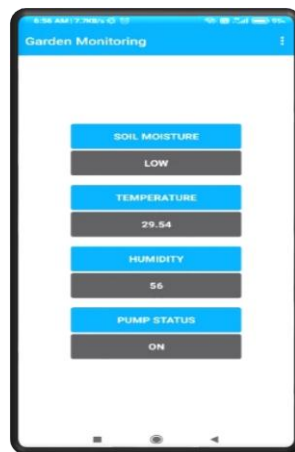


Figure 10. Monitor Garden

This is monitor garden page, this page can be accessed by watchman and secretary. Using this page user can switch on/off the motor. User can humidity, temperature and soil moisture value from their respective sensors. The motor will switch on automatically once the value decreases below threshold value and motor will switch off automatically once values are above threshold values.

Survey From

We have created an online survey form in which we have asked various questions regarding our application and its features. The online form was distributed to users from various backgrounds even non-technical users were also asked for their valuable feedback.

Questions:



Figure 1 Monitor Garden

Would you like to implement this system in your society
41 responses

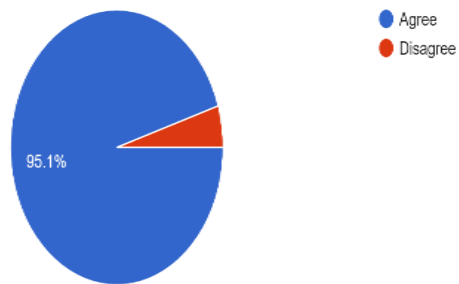
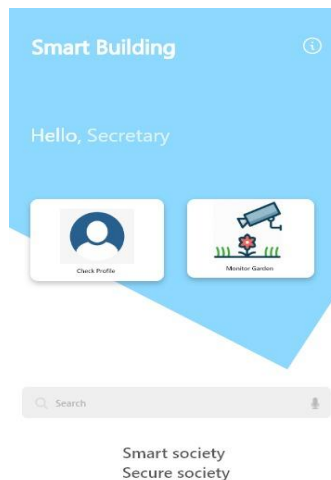


Figure 2. Analysis of Google survey form of our project

We asked users that the flat owner feature can be implemented in their society. Is it beneficial or not and can it reduce their workload?

We got 41 responses and out of these 41 responses 95% users said that these features can be implemented in their society.



Would you like to implement this secretary feature in your society
41 responses

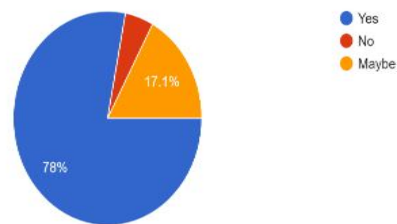
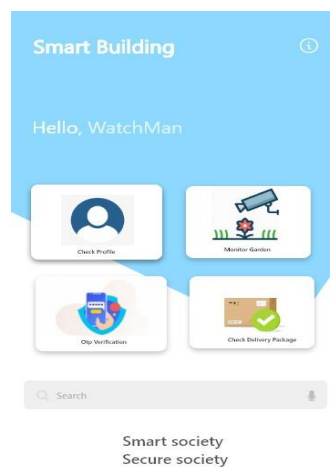


Figure 3. Analysis of Google survey form of our project for secretary feature

In secretary features that we have implemented in our application such as check daily help profile and monitor garden. We asked users that could these features will be used in there building.

We received 41 responses and out of 41 responses 78% users said that it could be implemented.



Does your watchman has smartphone to use this app
41 responses

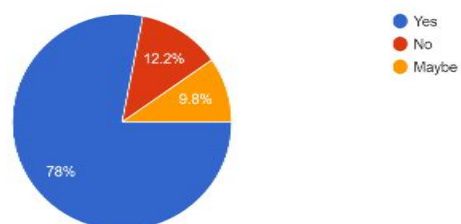


Figure 4. Analysis of Google survey form of our project for watchman feature

We have asked users that do watchman in their buildings use smartphones and can they use our application which will reduce their workload.
We received Yes response of 78% users out of 41 responses.

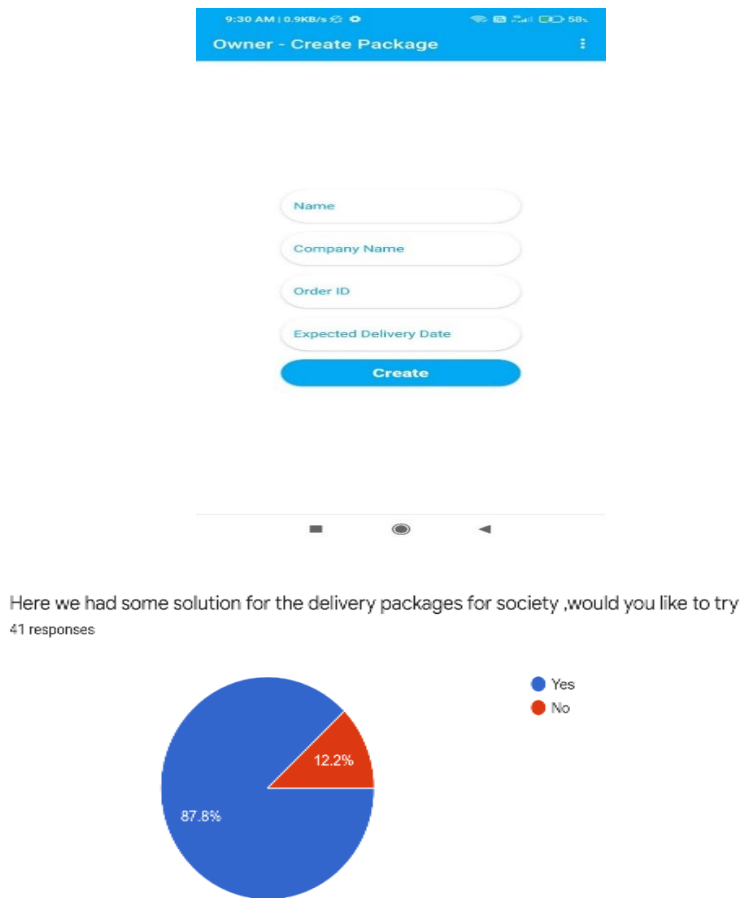


Figure 5. Analysis of Google survey form of our project for delivery feature

The delivery package feature which is a solution to the problem. So we have asked users whether they would like to try this feature in their society.

We received yes from 87% of users.

Other thoughts or comments for our app?

We asked users for any suggestion, that we could implement in our project.

Similarly, we had asked 3 other questions?

Would you suggest our app to others? : We asked users that could they suggest our application to other users.

how do you like the design of our app? : We asked users that did they like design of our application.

This is a system we are trying to implement, can be this use in your society? : With this question we have attached the monitor garden feature photo and we asked users that could these be implemented in their society.

System Requirement

Computer Hardware Requirements

- Intel i5 (or equivalent) processor or later
- 8 GB RAM (minimum)
- NVIDIA Graphics Processor that supports CUDA (recommended)
- 500 GB HDD / SSD

Software Requirements

- Node MCU
- Temperature Sensor
- Soil Moisture Sensor
- Software Requirements:
- OS: Windows 10
- Android Studio
- Arduino IDE

Conclusion

In this project, we proposed to develop a system that will bring end to the inconvenience caused to the security at gate. This system will even reduce the human workload as the watchman does not have to maintain a register/logbook, all the data will be stored in the database and the all the members can view the entries and exits of the building. The daily help workers will get a unique code and hence they will not have wait at gate for register entry. All the activities will be monitored online, from anywhere. The automated gardening system will save the water, which is the main goal of today's generation and this automated gardening system will encourage people to plant more trees as they can monitor everything from their mobile.

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