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i Project Report On SMART CITY Submitted By BASITA RONAK (180163107002) CHAVDA DARSHAN (180163107010) RIYAZKHAN PATHAN (180163107027) Guided By: Prof. V.R PATEL OCTOBER -2020 Submitted To, Department of Computer Engineering & Information Technology Government Engineering College, Modasa

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iii ABSTRACT ➢ Smart City is an IOT based project. Internet of things can be used to build a smart city in which all places in a smart city are interconnected with each other with IOT component for efficient usage of resources. ➢ Smart city can have smart parking system, smart waste management, smart water supply for home or public water tanks, automatic street lights any many other things. ➢ Smart city project is about managing different modules that are used in daily routine like different corporate department of city automatically by using Information Technology, Digital Electronics and some help of Electronic Engineering.

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1 CHAPTER – 1 INTODUCTION 1.1 Project Goal and Objectives 1.2 Overview of proposed system 1.3 Scope

2 INTRODUCTION ➢ “Smart City” is an IOT based project. The internet of things can be used to build a smart city in which all the places/modules in smart city are interconnected with each other with IOT components for efficient usage of resources. ➢ Smart city can have smart parking system, smart waste management, smart water supply for home or public water tanks, automatic street light, etc. ➢ Our project is about managing different modules that are used in daily routine like different corporate department of city automatically by using Information Technology, Digital Electronics and some help of Electronic Engineering. ➢ There is no limit of the things we can include in a smart city. ➢ In this project, we implement this all modules using Microcontroller, Some IDEs to program the microcontroller, some electronic sensors and sending the data to database and receiving the data from database. 1.1 Project Goal and Objectives ➢ The objective of “Smart City” Project is about automation of some places that are in the city like Smart parking system, Automatic street light, Smart waste management, smart water supply for home or public tanks to promote cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment. ➢ Primary Modules of Project: o Smart Parking System o Smart Waste Management o Automatic Street Light o Smart Water Supply for Home or Public Tanks

3 1.2 Overview of proposed system ➢ In “Smart City” project our team is just trying to manage different places of city with the help of some electronic devices, Information technology and IOT technology. ➢ Here we are going to discuss the overview of different primary modules of project. 1. Smart Parking System ➢ In smart parking system the status of all parking areas of city is maintained online on database and displaying the status of all parking area on websites and LCD display which is installed outside the parking. ➢ In parking area, we use different types of sensors to calculate the numbers of vehicle available in parking and free space in parking. ➢ If there is no free space in parking area, the car will not allowed to be entered. 2. Smart Waste System ➢ One of the modules of Smart city is Smart Garbage, as we know there is no automation at all in our current waste system, so there are many problems in present days with workers of waste system like somewhere a dustbin is full but they have no idea about it. ➢ Our system will cover this problem with the facilities like providing notification service to dumping station so that worker can know about the status of dustbin like if the dustbin is full or not. ➢ The notification will be sent to dumping station using Arduino microcontroller, ESP8266 Module, Ultrasonic sensor and database and dumping station worker can also observe the status of dustbin. 3. Smart Water Distribution System ➢ in smart water distribution system, we will manage the level of water tank of the area

automatically using water sensors and microcontroller. ➢ If the level of water tank goes above 90% the motor will automatically turn off, the supplement of water will be stopped. ➢ And the water level of tank goes down below 25% the motor will turn on automatically the supplement of water will be resumed.

4 4. Street Light System ➢ Presently Street Lights remains on even though no necessary. ➢ We will cover this problem by providing Each Light the dedicated sensors so if there is no object detect then the lights remain off and if the object is detect then the lights are automatically on using the Arduino microcontroller, LDR sensor, Motion sensor and Database for observing the status of street lights. ➢ So, using this we can save the electricity. 1.3 Scope ➢ The user need a internet connection, with help of internet connection user or vehicle driver can see the status of parking area and if the parking slots is full then it will not allow to park their vehicle and if parking slot is not full then it allows to enter and park their vehicle in particular parking slot. And also in the smart waste the notification will sent to dumping station from dustbin using an internet connection, database and microcontroller. ➢ In water supply system also we need an internet for observing the water level of water tanks. If user don't have internet then it cannot see the current status of any area in smart city. ➢ In street light system there is a motion sensor which detects the movement in its surrounding and if any movement is detected then motion sensor sends the signal to microprocessor which controls the light according to the signal. ➢ No internet service is required for this purpose but if admin wants to observe the status of different street light online, then internet connection is required.

5 CHAPTER – 2 SYSTEM ANALYSIS & SPECIFICATION 2.1 User characteristics 2.2 Feasibility study

6 2.1 User Characteristics:- The user or citizens of the city plays his/her role as a client and they get the services from the microcontroller and database using an internet connection. Citizens: Here the vehicle driver can use this by observing a current status of parking slot by sending request to database and database will response to this request by observing the status of microcontroller. Admin: The admin of water distribution system can observe the level of water tank online using the website provided by us. And also control the motor of the water tank. The admin of the dumping station can observe the status of all dustbin of the area on the website and according to that, he can take proper action while on time.

7 2.2 Feasibility Study Once scope has been identified, it is reasonable to ask whether we can build the system that meets this scope. Is this project feasible? 2.2.1.Technical feasibility ➢ The user of this system shouldn't require high technical skills to operate it, but yes, he/she needs basic knowledge of the electronic component used. ➢ Arduino is a very popular and easy to use microcontroller, so we can easily develop our project using it. ➢ Arduino programming is comfortable and different sensors can easily be managed using Arduino microcontroller. ➢ So, there is a high possibility to achieve our goal of making smart city using Arduino. 2.2.2. Economic feasibility ➢ As we building this project for whole city, and most of the modules of our project is fully or partially related to government departments. ➢ The Arduino Microcontroller and Arduino Shields are very cheaper electronic devices. ➢ Despite using more tools, we can make projects in a lower budget. ➢ There is a high chance of develop our project in cost effective manner.

8 CHAPTER – 3 DESIGN & MODELING 3.1 Activity Diagram 3.2 Usecase Diagram

9 3.1 Activity diagram The activity diagram represents the flow of activity in terms of behavior and designing an activity diagram helps the development team to recognize when the activity starts, which activity starts and when it gets terminated. ➢ Activity Diagram of Water supply system

10 ➢ Activity Diagram of Water supply system

11 3.2 Usecase diagram The us case diagram is an UML diagram which represents the modules as actors of the system and their attachments which the use cases define in the system box. ➢ Usecase diagram of waste management system

12 CHAPTER – 4 METHODOLOGY 4.1 Methodology 4.2 Required Components 4.3 Platforms

13 4.1. METHODOLOGY ➢ We have used the Arduino microcontroller which is used to control the all iot devices and it is an open source iot platform and worldwide used for various purpose. We need to program this microcontroller. To program Arduino microcontroller we used Arduino IDE. ➢ The version of WiFi Module used is ESP-8266 WiFi module and we need to interface it with our Arduino microcontroller for connecting our devices to internet.The another components that required are Ultrasonic Sensor, Ultrasonic Sensor, LDR sensor, Water level measure sensor, LED , IR sensors, LCD Display, Relay Module ,Temperature and Humidity for performing various task. ➢ We need to connect our microcontroller with database for sending or receiving the data to or from database using ESP-8266 WIFI Module. ➢ We need to supply 5V power to Microcontroller. Sensors send the signal (Analog and Digital) to microcontroller and then Using ESP-8266 WiFi Module microcontroller send data to database and depend upon the value of database the action will be performed

like send notification to Dumping Station, turn on Street Lights, Supply Water to water tanks and allowing to park vehicle or not etc.

14 4.2. Required Components:- ➢ Arduino Microcontroller ➢ NodeMCU ➢ ESP 8266 Module ➢ Ultrasonic Sensor ➢ LDR sensor ➢ Water level measure sensor ➢ LED ➢ IR sensors ➢ LCD Display ➢ Relay Module ➢ Temperature and Humidity 4.3. Platfroms:- ➢ Arduino IDE ➢ Tinkercad ➢ MIT App Inventor

15 CHAPTER – 5 DESIGN AND DEVELOPMENT 5.1 Project description 5.2 Platform

16 DESIGN AND DEVELOPMENT This chapter contains the overall development and designing of our project and the requirement for better operability. 5.1 Project Description • The above figure illustrates the implementation of the smart water supply system. One of the phase lines is attached to relay module and neutral of the main supply is connected directly to the water pump/motor. • The phase then connected via relay module. • Relay module is controlled by Arduino Microcontroller. • The water level sensor senses the water level of tank and send the information to microcontroller. • The Arduino microcontroller then takes proper decision to turn the motor on or off. • The Wi-Fi Module (ESP-8266) is connected with Arduino to provide network connectivity to whole module.

17 5.1.1 Components used: 1. Arduino Microcontroller 2. ESP 8266 3. Relay Module 4. LDR Sensor 5. Water level sensor 6. Ultrasonic Sensor 7. LED 8. LCD display ➢ Arduino Uno: o

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Arduino Uno microcontroller board is based on ATmega328P.It has 14 digital input/output pins, 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack and a reset button.

It requires 5 V power supply to activate. o We program this microcontroller using Arduino IDE to control all different types of sensors and modules etc.

18 ➢ ESP-8266 Wi-Fi Module: o ESP-8266 Wi-Fi Module is the main component of our project. It connects our Microcontroller and electronic sensor or module to internet. Using this microcontroller can send the data to database and receive the data from database. o In Arduino Microprocessor we need to interface esp-8266 externally and it can be controlled from local Wi-Fi network or internet. ➢ Ultrasonic sensors: o Ultrasonic sensor is an electronic device that measure the distance of object by sending ultrasonic sound wave. It has two components.one is transmitter and second is receiver. Transmitter send ultrasonic wave and receiver receives ultrasonic wave. Transmitter send ultrasonic wave and if any object is in front of ultrasonic sensor than the wave is reflected and received by receiver. o In order to calculate the distance between the sensor and object, the formula is D=(T*C)/2 where, D is the distance, T is the time, and C is the speed of sound ~ 343 meters/second.

19 ➢ LDR Sensor: o LDR sensor is also called photoresistor sensor. When lights fall on it then it gives low signal to the microprocessor if there is not then it gives HIGH signal to microprocessor. ➢ Water level measure sensor: o Water level measure sensor is used for measuring the level of water tank. This sensor gives signal or data to microcontroller and then microcontroller send this data to database and then depends on the value that it will supply water to water tanks using relay module to activate water motor. ➢ LED: o Led is used for the lighting purpose. In our project depends on the current status of Motion Sensor and LDR Sensor it will turn OFF and ON.

20 ➢ LCD Display: o LCD require 5v current to operate. LCD used for displaying the data on the screen and it is connected to the microcontroller and depends on program it gives the displaying the data on screen. It can be also used for reading and writing.

21 5.2 Platforms: Arduino IDE • The Arduino IDE is the tool, which we used to program the micro- controller of the Arduino. • Arduino software is easy to use and free open source also available for all operating system like Windows, Linux, and Mac etc. • That software is based on C++ and we can easily write and verify, upload the program in Arduino board. Language: Arduino (Consists: Java, Python, C++, C, etc.)

22 CHAPTER – 6 LIMITATION AND CONCLUSION 6.1 Advantages and Disadvantages 6.2 Future Scope 6.3 Conclusion 6.4 References

23 6.1 Advantages and disadvantages of the system As every existing system has some advantages and limitations. The advantages and disadvantages of our project is given below. 6.1.1. Advantages ➢ Reliable: o The proposed System is reliable and trustworthy as until any electricity overload, it serves a user the best functionality. ➢ Easy to Access: o It can be easily accessed by any citizen in the city because it has simple UI for observing the status of some places in city and dumping worker can easily know the location of the overflowed dustbin. ➢ Simple: o The platform used for configuring it, has a user-friendly environment and easily understood by everyone. ➢ Internet Access: o User can use it from anywhere using an internet connection. 6.1.2. Disadvantages ➢ Needs Maintenance: o As the proposed system is based on hardware equipment, each and every module has a risk of get damaged by time so between some period of time the maintenance is needed. ➢ Complex Wiring: o The pin number, electronic sensors and module has possibilities of mismatching and thus the proper table must be maintained, otherwise it will no more an accurate service. ➢ Network connection: o For providing online data at database all the modules of project are required to be connected to the internet every time.

24 6.2 Conclusion ➢ In simple words our project is about to automate the city with the help of modern technologies to simplify the work of normal human being as easy as possible. ➢ The Smart City agenda entails improving the citizens quality of life, strengthening and diversifying the lifestyle while prioritizing environment sustainability through adoption of smart solutions. 6.3 Future Scope ➢ As we know there is no limit that can include in the smart city but we have some time limitation of only half of a year to implement our project. ➢ So, we decide to complete only essential module first, and then if time allows, we will also cover more modules. ➢ First, we want to cover our primary module and then if time allows then we will cover our secondary module and extend our smart city project. ➢ Our secondary modules are traffic management system, air pollution management etc. 6.4 References: - ➢ Online IDE for Circuit Designing • https://www.tinkercad.com/dashboard ➢ Open Source IDE for Arduino Development • https://create.arduino.cc ➢ GitHub: • https://github.com/ ➢ Google Firebase • https://firebase.google.com/ ➢ Thingspeak Cloud • https://thingspeak.com/

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button.

Arduino Uno is a microcontroller board   based on   the ATmega328(It has 14 digital
input/output pins(of which 6 can be used as PWM outputs),6 analog inputs, a 16 MHz crystal oscillator,
a USB connection ,a power jack, an ICSP header , and a reset button.

2.2.2

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