ABSTRACT

The project 'Cook by a Click' provides an Android application and a device to the end user for complete automation of cooking rice. User can give instructions to the mobile application, and the same will be received by the device which cooks the rice.

Food is one of the basic needs of human being. For the busy 21st century families, sitting down at the table for a healthy, home cooked meal seems quite difficult. People from working sector in their busy schedules hardly find free time for cooking. With the advancement of technology, people need automation in every field. Why should cooking be an exception?

Rice is one of the three leading food crops in the world which is grown from historic days. It is the staple food of over half of the world's population. So, making the process of cooking rice fully automatic which requires no human intervention would be of great help to those who do not have time.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

From the ancient era till date cooking food manually has always been a common task. In this world of technology we find automation everywhere and cooking is one such field where we lack in complete automation. Regardless of a busy and hectic schedule, people still spend their valuable time in cooking. India ranks on the top in spending time on cooking food [1].India is second largest producer and consumer of rice in the world and accounts for 22.3 % of global production [2]. Rice is the most consumed ingredient in India [3]. Focusing on the most consumed food ingredient and the concept of complete automation in cooking field we crop up with the idea of "Cook by a click" where rice is cooked completely from scratch by just a click from mobile phone.

According to a global survey done on people who don't cook food, 45 percent of people replied that they don't prefer cooking because they do not have time for cooking [4]. Due to this reason people often end up ordering food from restaurants. On an average to order food from restaurants the cost is almost three times as expensive as cooking food [5]. Eating outside food is not only expensive, but also harmful for health. It may be difficult to expect hygienic as well as healthy food even from high class restaurants.

Now a day in food industry manually taste and quality will not be repeatable but by automation we can perform this repeatedly by reducing the errors. The automation always gives fruitful results in industry. This automated cooking machine gives improved quality, reduced manpower and time which results in increased profit with reducing the food wastage. This kind of cooking system is one of the areas that have received the most attention in terms of automation.

1.1 Internet of Things (IoT):

The Internet of things (IoT) is the extension of Internet connectivity into physical devices and everyday objects. Embedded with electronics, Internet connectivity, and other forms of hardware (such as sensors), these devices can communicate and interact with others over the Internet, and they can be remotely monitored and controlled.

The definition of the Internet of things has evolved due to convergence of multiple technologies, real-time analytics, machine learning, commodity sensors, and embedded systems. Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation), and others all contribute to enabling the Internet of things. In the consumer market, IoT technology is most synonymous with products pertaining to the concept of the "smart home", covering devices and appliances (such as lighting fixtures, thermostats, home security systems and cameras, and other home appliances) that support one or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as smart phones and smart speakers. The IoT concept has faced prominent criticism, especially in regards to privacy and security concerns related to these devices and their intention of pervasive presence.

1.2 Problem statement:

- Lack of complete automation in cooking rice
- Difficulty in finding time to cook in busy Schedule.

1.3 Objectives:

- To build a prototype; which cook the rice by taking measured quantity of ingredients (Such as: Rice, water) from the storage.

- To develop an android app, that can control and monitor the real time status of the cooking.

CHAPTER 2:

LITERATURE SURVEY

The concept of a network of smart devices was discussed as early as 1982, with a modified Coke vending machine at Carnegie Mellon University becoming the first Internet- connected appliance, able to report its inventory and whether newly loaded drinks were cold or not. Mark Weiser's 1991 paper on ubiquitous computing, "The Computer of the 21st Century", as well as academic venues such as UbiComp and PerCom produced the contemporary vision of the IoT. In 1994, Reza Raji described the concept in IEEE Spectrum as "[moving] small packets of data to a large set of nodes, so as to integrate and automate everything from home appliances to entire factories". Between 1993 and 1997, several companies proposed solutions like Microsoft's at Work or Novell's NEST. The field gained momentum when Bill Joy envisioned device-to-device communication as a part of his "Six Webs" framework, presented at the World Economic Forum at Davos in 1999.

The term "Internet of things" was likely coined by Kevin Ashton of Procter & Gamble, later MIT's Auto-ID Center, in 1999, though he prefers the phrase "Internet for things"[7]. At that point, he viewed Radio-frequency identification (RFID) as essential to the Internet of things, which would allow computers to manage all individual things.

A research article mentioning the Internet of Things was submitted to the conference for Nordic Researchers in Norway, in June 2002, which was preceded by an article published in Finnish in January 2002. The implementation described there was developed by Kary Framling and his team at Helsinki University of Technology and more closely matches the modern one, i.e. an information system infrastructure for implementing smart, connected objects.

Defining the Internet of things as "simply the point in time when more 'things or objects' were connected to the Internet than people", Cisco Systems estimated that the IoT was "born" between 2008 and 2009, with the things/people ratio growing from 0.08 in 2003 to 1.84 in 2010 [8].

Looking to the future, Cisco IBSG predicts there will be 25 billion devices connected to the Internet by 2015 and 50 billion by 2020. It is important to note that these estimates do not take into account rapid advances in Internet or device technology; the numbers presented are based on what is known to be true today. Additionally, the number of connected devices per person may seem low. This is because the calculation is based on the entire world population, much of which is not yet connected to the Internet. By reducing the population sample to people actually connected to the Internet, the number of connected devices per person rises dramatically.

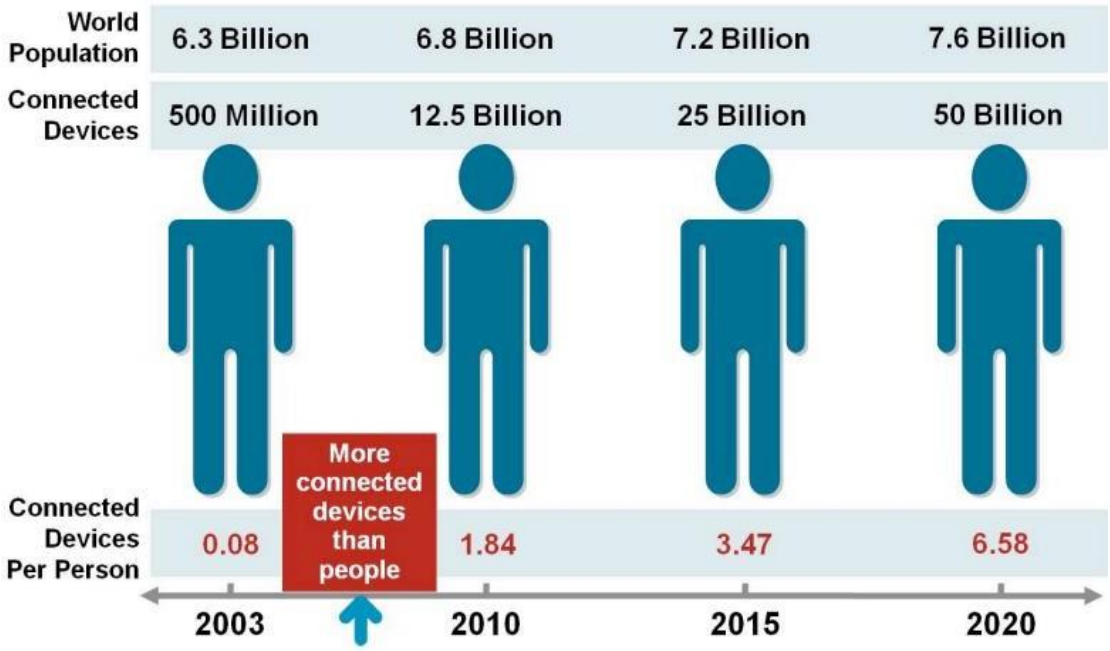


Figure 2.1: The Internet of Things (ORIGIN).

CHAPTER 3

METHODOLOGY

3.1 Hardware Requirements

- NodeMCU ESP8266
- Servo motor
- Relay
- 5v DC power supply
- 230 v (50 Hz) AC power supply
- Submersible water pump
- Electric Rice cooker
- Rice storage and Water storage

3.2 Software Requirements

- Android Studio
- Arduino IDE
- Google Firebase

3.3 Existing methodology:

3.3.1 Traditional method of cooking rice:

Cooking of rice involves following three important steps:

- Collecting measured quantity of ingredients.
- Washing of rice.
- Cooking of rice.

In traditional method of cooking rice, all the above steps are done manually.

3.3.2 Cooking rice in electric cooker:

Electric rice cooker is an appliance which cooks rice semi-automatically provided the ingredients (Such as: washed Rice, Salt, measured quantity of water) are present in the cooker. Except cooking rice, all other tasks have to be done manually which is quite similar to traditional way of cooking.

3.4 Proposed methodology:

The proposed solution involves complete automation in cooking rice. Rice will be cooked just by receiving few instructions from mobile phone.

3.4.1 BLOCK DIAGRAM

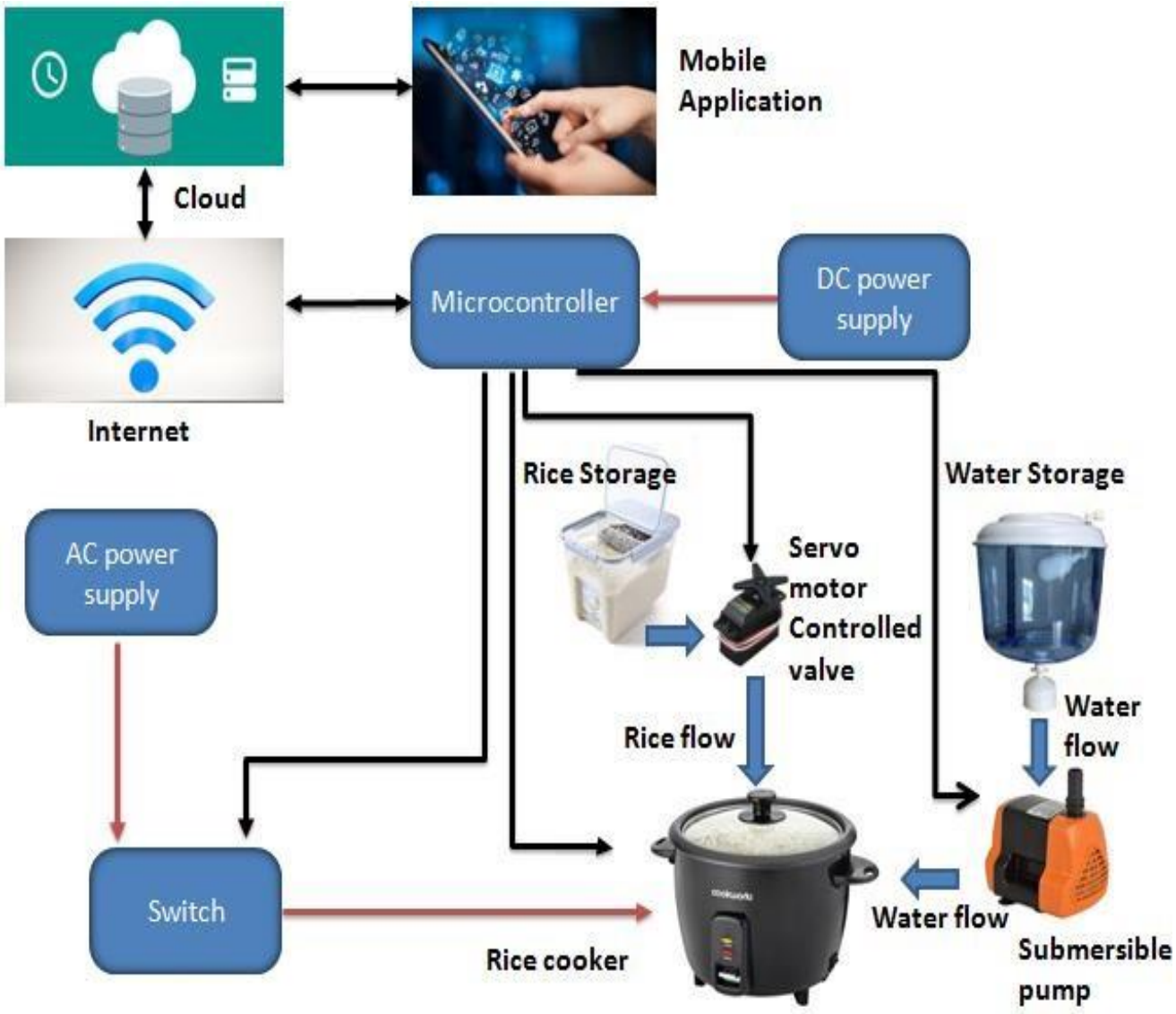


Figure 3.1: Block Diagram

3.4.1.1 NODEMCU ESP8266

NodeMCU is an open source LUA based firmware developed for ESP8266 wifi chip. Since NodeMCU is open source platform, their hardware design is open for edit/modify/build. NodeMCU Dev Kit/board consists of ESP8266 wifi enabled chip. The **ESP8266** is a low- cost Wi-Fi chip developed by Espressif Systems with TCP/IP protocol. NodeMCU Development board is featured with wifi capability, analog pin, digital pins and serial communication protocols.

Figure 3.2: NodeMCU ESP8266

3.4.1.2 SERVO MOTOR

The servo motor has a rotation detector (encoder) mounted on the back shaft side of the motor to detect the position and speed of the rotor. This enables high resolution, high response positioning operation.

Servo motors have been around for a long time and are utilized in many applications. They are small in size but pack a big punch and are very energy-efficient. These features allow them to be used to operate remote-controlled or radio-controlled toy cars, robots and airplanes. Servo motors are also used in industrial applications, robotics, in-line manufacturing, pharmaceutics and food services.

Figure 3.3: Servo motor

3.4.1.3 RELAY

Relay is a switch which controls (open and close) circuits electromechanically. The main operation of this device is to make or break contact with the help of a signal without any human involvement in order to switch it ON or OFF. It is mainly used to control a high powered circuit using a low power signal. Generally a DC signal is used to control circuit which is driven by high voltage like controlling AC home appliances with DC signals from microcontrollers.

Figure 3.4: Relay

3.4.1.4 SUBMERSIBLE PUMP

A submersible pump, also called an electric submersible pump, is a pump that can be fully submerged in water. The motor is hermetically sealed and close-coupled to the body of the pump. A submersible pump pushes water to the surface by converting rotary energy into kinetic energy into pressure energy. This is done by the water being pulled into the pump: first in the intake, where the rotation of the impeller pushes the water through the diffuser. From there, it goes to the surface.

The major advantage to a submersible pump is that it never has to be primed, because it is already submerged in the fluid. Submersible pumps are also very efficient because they don't really have to spend a lot of energy moving water into the pump. Water pressure pushes the water into a submersible pump, thus "saving" a lot of the pump's energy.

Figure 3.5: Submersible pump

3.4.1.5 ELECTRIC COOKER

A rice cooker or rice steamer is an automated kitchen appliance designed to boil or steam rice. It consists of a heat source, a cooking bowl, and a thermostat. The thermostat measures the temperature of the cooking bowl and controls the heat. Complex rice cookers may have many more sensors and other components, and may be multipurpose.

The bowl is filled with rice and water and heated at full power; the water reaches and stays at boiling point (100 °C, 212 °F). When the water has all been absorbed, the temperature can rise above boiling point, which trips the thermostat. Some cookers switch to low-power mode, keeping the rice at a safe temperature of approximately 65 °C (150 °F); simpler models switch off; the rice has entered the resting phase.

Figure 3.6: Electric Rice cooker

3.4.1.6 ANDROID STUDIO

Android Studio is the official IDE for android application development. To support application development within the Android operating system, Android Studio uses a Gradle-based build system, emulator, code templates, and Github integration. Every project in Android Studio has one or more modalities with source code and resource files. These modalities include Android app modules, Library modules, and Google App Engine modules.

Figure 3.7: Android Studio

3.4.1.7 FIREBASE REAL-TIME DATABASE

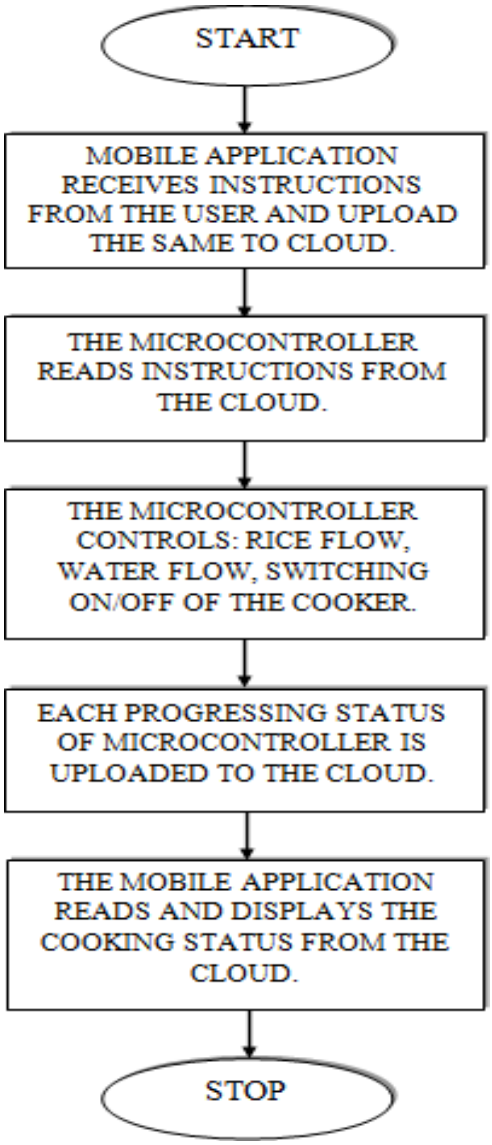
Firebase provides a real-time database and backend as a service. The service provides application developers an API that allows application data to be synchronized across clients and stored on Firebase's cloud. The company provides client libraries that enable integration with Android, iOS, JavaScript, Java, Objective-C, Swift and Node.js applications. The database is also accessible through a REST API and bindings for several JavaScript frameworks such as AngularJS, React, Ember.js and Backbone.js. The REST API uses the Server-Sent Events protocol, which is an API for creating HTTP connections for receiving push notifications from a server. Developers using the real-time database can secure their data by using the company's server-side-enforced security rules.

Figure 3.8: Google Firebase

CHAPTER 4

IMPLEMENTATION

4.1 Process Flow



4.2 Mobile Application

The mobile application provides two operations:

1. 'COOK NOW': This operation provides the user to cook rice instantly.

2. 'SCHEDULE COOKING': This operation provides the user to schedule cooking of rice at a particular time.

4.2.1 'COOK NOW' operation:

The mobile application consists of a home screen as shown in Figure 4.1. Upon clicking 'COOK NOW' button, an activity will appear which asks the user to enter quantity of rice as shown in Figure 4.2 where the amount of rice has 2 options based on cooker size: 1 for 100 g and 2 for 200 g. After the 'START COOKING' button is clicked, the next screen appears which shows the status of cooking as shown in Figure 4.3.

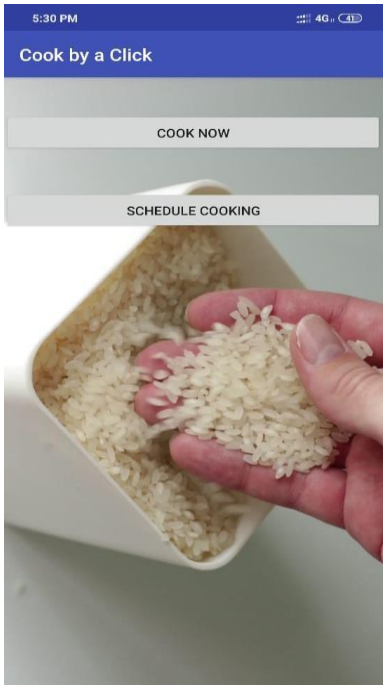


Figure 4.1: Home screen of the mobile application

Figure 4.2: Activity after 'COOK NOW' button is clicked

Figure 4.3: Activity after 'START COOKING' button is clicked

4.2.2 'SCHEDULE COOKING' operation:

The mobile application consists of a home screen as shown in Figure 4.4. Upon clicking 'SCHEDULE COOKING' button, an activity will appear which asks the user to enter quantity of rice and time for schedule cooking as shown in Figure 4.5. A dialog box appears to set the time in hours and minutes when 'Schedule Time' is clicked as shown in Figure 4.6. After clicking 'SCHEDULE COOKING' button, the next screen appears which shows the status of scheduled time set as shown in Figure 4.7. An additional button for cancelling the cooking process is provided to terminate the process of cooking rice before it is started.

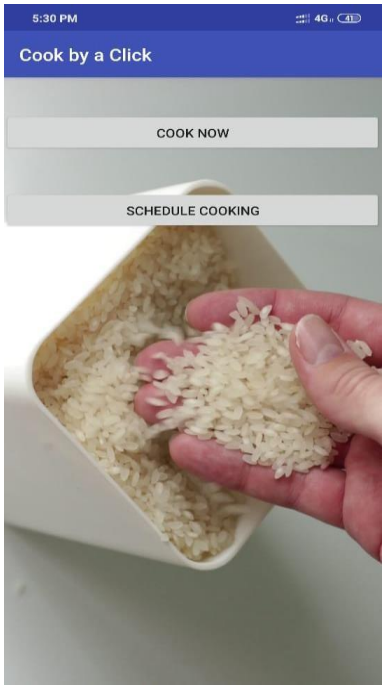


Figure 4.4: Home screen of the mobile application

Figure 4.5: Activity after 'SCHEDULE COOKING' in home screen is clicked.

Figure 4.6: Dialog box appears when the option 'schedule time' is clicked which asks the user to set time in hours and minutes

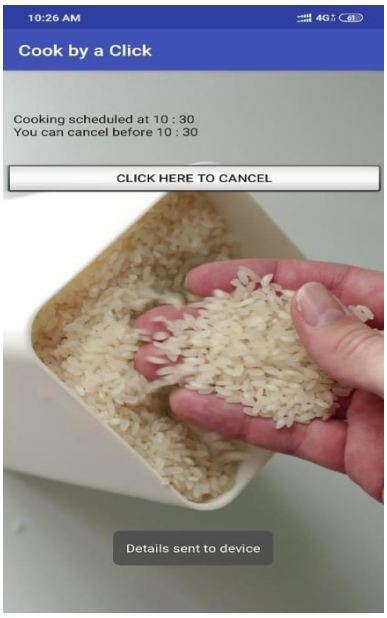


Figure 4.7: Activity to show the status of scheduled time set in the mobile application

4.3 Cooking Device

The Cooking Device consists of NodeMCU ESP8266 as a microcontroller, 5v Relay as a switch for switching on/off the AC power supply, Servo motor for controlling the rice flow, 5v DC power supply for powering the microcontroller and servo motor, Submersible water pump for controlling the water flow, Electric Rice cooker for cooking the rice, 230 v (50 Hz) AC power supply for powering Electric Rice cooker and Submersible water pump, Rice storage, and Water storage.

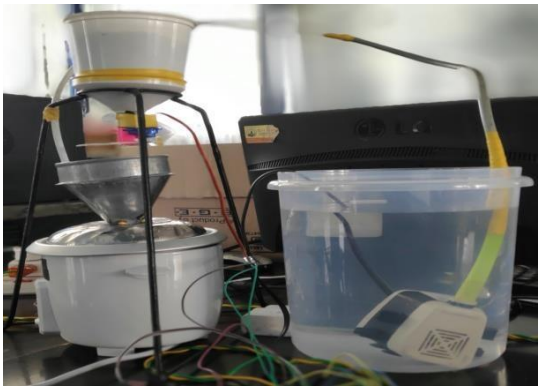


Figure 4.8: The Cooking Device

CHAPTER 5

ADVANTAGES AND DISADVANTAGES

5.1 ADVANTAGES

- Rice will be cooked just by using mobile application which is much easier to cook rice rather than cooking manually.
- This proposed model/product is cost efficient as it is run by electricity which is cheaper than LPG cylinders.
- The proposed project provides flexibility to the users to operate the device from any place through internet.

5.2 DISADVANTAGES

- User should have smart phone in order to use all features of the cooking device.
- The cooking device runs on electricity, any power failure will turn off the system.
- Internet connection is necessary for the communication of mobile application and cooking device.

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

6.1 CONCLUSION

- The project demonstrates complete automation in cooking field. By the implementation of this project people can save their valuable time from their busy schedule.
- A device and a mobile application are developed.
- The device cooks rice automatically by receiving instructions from the mobile application.

6.2 FUTURE SCOPE

- The proposed project "Cook by a Click" should not only be limited for cooking rice, it should be extended for other food items.
- To upgrade the system, such that it can be used without internet and electricity.
- To remove cooking errors with the help of machine learning algorithms**.**

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