



REMOTE ACCESS OF A GREENHOUSE AUTOMATION

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- ▶ The formation of a suitable air conditioner environment for the growth and development of plants in greenhouses is provided by controlling the variables such as temperature, relative humidity, and sunshine in the greenhouse.
- ▶ However, the climatic data desired in the greenhouse constantly change due to the effects of the sun, temperature, rain, etc. outside the greenhouse. Controlling variables from one hand is both difficult and costly.
- ▶ In this study, an automation is created to ensure that variables such as temperature, relative humidity, and solar radiation in the greenhouse are sensed with the help of sensors and remain within the desired intervals. This automation was implemented on a greenhouse model. The digital and analog data to be obtained from the sensors will be processed in the project and the data can be viewed on the computer screen. In addition, with the help of an android interface application created, remote access was provided to keep the system under control.

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- ▶ Thanks to the rapid developments in the field of electronics and computers, the concept of automatic control has become widespread in every field and has made people's lives easier. Today, many domestic and foreign companies receive services from the automation industry. In this way, they both reduced labor costs and increased the rate of profit by speeding up production.
- ▶ Automation system is the work provided by computers, mechanical tools and self-powered machines, that was previously done with human labor. This definition was previously defined as the automatic transfer of materials from one machine to another during the manufacturing period, by performing a certain part of production in each, without the need for human labor. With the development of technology, automatic communication and control mechanisms have been added to this system, communication is the operation of a machine or production vehicle in line with the information in the computer program [1].

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- ▶ Greenhouse is the facility where production and development conditions are artificially provided in regions or climates where the growing conditions of a plant cannot be met. It is a common method for a vegetable, fruit or flower not to be limited to only the seasons and regions where it can be grown [4].
- ▶ It is estimated that the first greenhouse was used in a botanical garden in Italy towards the end of the 15th century. Then, especially in Europe, in the 17th century, protective and translucent greenhouses were started to be used by taking advantage of the feature of glass. These greenhouses are divided into three parts: cold, warm and hot. Among them, plants of the Mediterranean region, tropical and subtropical regions were also grown. The types of greenhouses that are divided into sections on the soil, in the soil and on the wall are found in the Mediterranean region [5].

PROJECT DESIGN

- ▶ By bringing greenhouse climates to desired values, it is ensured to increase the quality of the product grown in the greenhouse, increase the growth rate and give more products. The most important greenhouse climate features; such as indoor air temperature, soil moisture, air humidity and amount of light.
- ▶ Increasing or decreasing these values significantly affect the quality of the products. In this study, it will be tried to be shown by the experiment that the yield and quality of the product can be increased when the climate conditions in the greenhouse are kept at the desired values.

PROJECT DESIGN

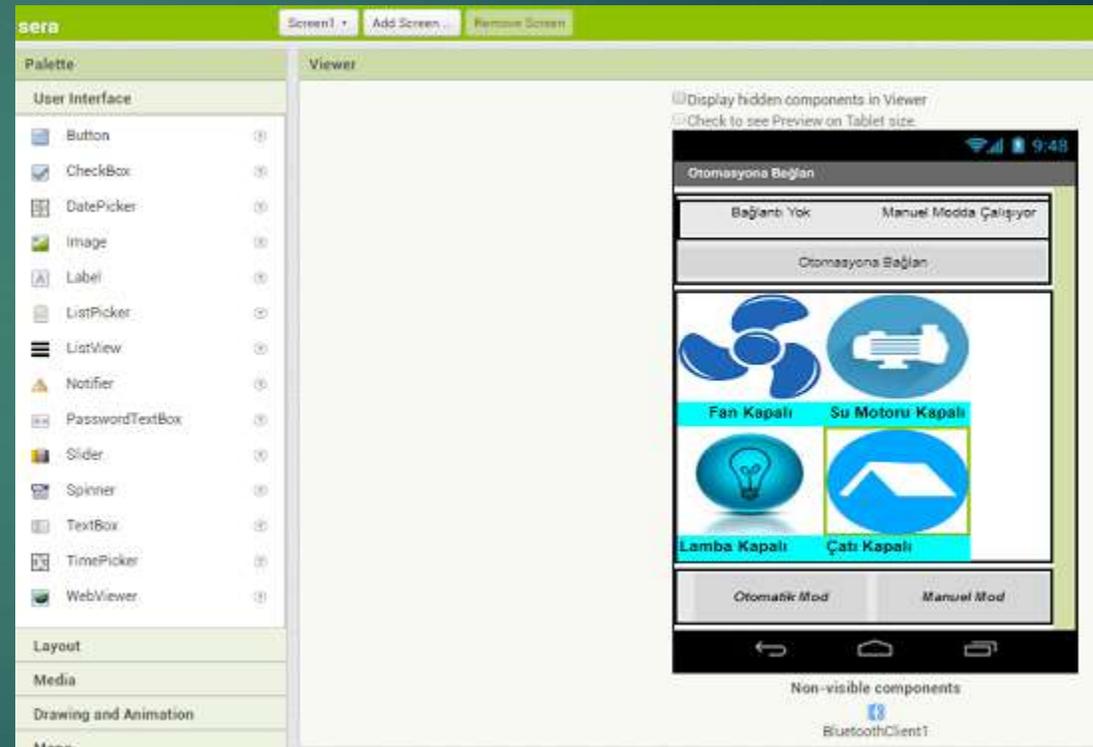
- ▶ DHT11 Temperature and Humidity Sensor Module, DHT11 is a sensor board based on temperature and humidity sensor. Card can measure temperature between 0°C - 50°C and humidity between 20% -90% RH [9]. In the greenhouse model I created, I used the dht11 humidity and temperature sensor to obtain indoor greenhouse temperature and humidity information.
- ▶ The soil moisture sensor is a sensor that you can use to measure the moisture content of the soil or the level of a small scale liquid. Moisture meter probes are used by immersing them in the environment to be measured. Due to the resistance caused by the soil or the liquid immersed in it, a voltage difference occurs between the probe stylus. Humidity can be measured according to the magnitude of this voltage difference.
- ▶ As the humidity in the soil increases, its conductivity increases. Sensitivity can be adjusted with the trim pot on the card [10]. In the greenhouse model I created, I used the soil moisture sensor to measure the humidity of the greenhouse soil. According to the information I obtained here, I determined the working range of the water engine.

PROJECT DESIGN

- ▶ LDR Light Sensor is produced from photosensitive materials such as Silicon (Si), Germanium (Ge) and Cadmium Sulfur (CdS), as well as Diodes and LEDs (Light Emitting Diode), which are also types of diodes. When the amount of light falling on it increases, the resistance value increases, and as the amount of light falling on it decreases, the resistance value decreases.
- ▶ Water pump, The pump switches on and off according to the data from the soil moisture sensor. The pump can operate at 4.5-12 volts voltage. In the greenhouse model I created, the water engine was used to adjust the moisture content of the soil.
- ▶ In the greenhouse model, the servo motor is used to open and close the roof. It can be operated manually as well as in the event that the amount of moisture in the greenhouse increases excessively, it works together with the fan to ensure that the moisture content in the greenhouse remains at the desired level.

ANALYSIS AND RESULTS

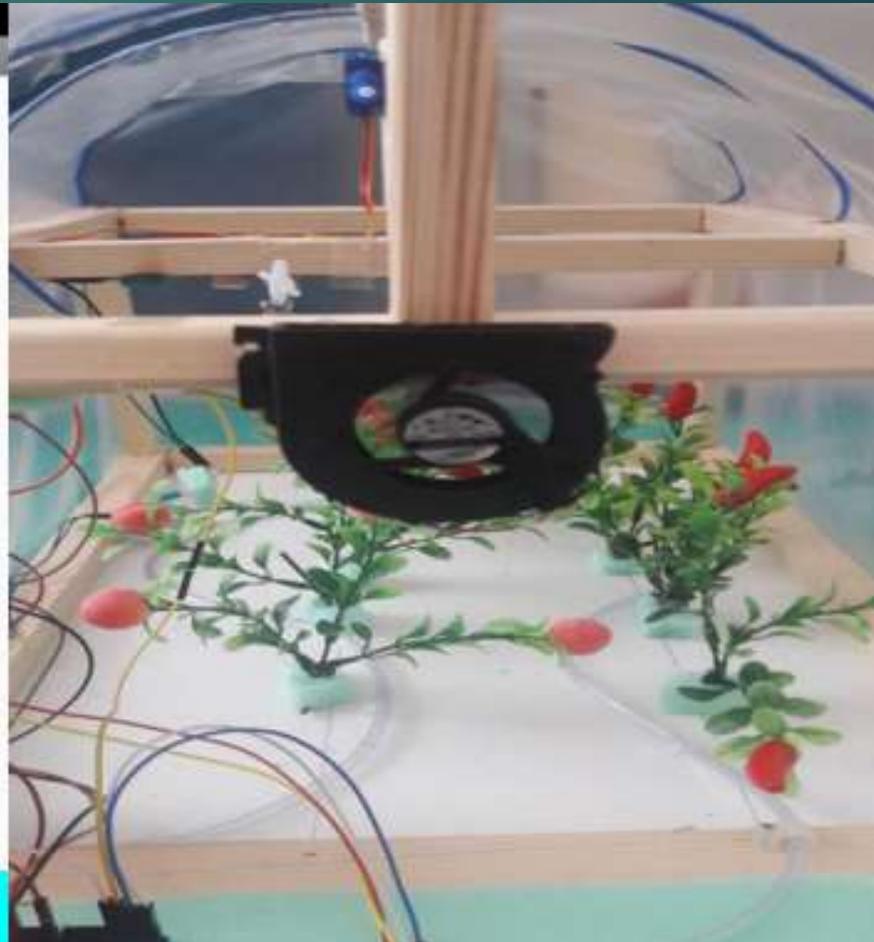
- ▶ Greenhouse Automation Interface, The android application of the system works in two modes, these are automatic and manual mode. In manual mode, the person turns the actuators on and off herself. In automatic mode, it operates according to the intervals defined in the system. This application was made through the MIT APP inventor site.



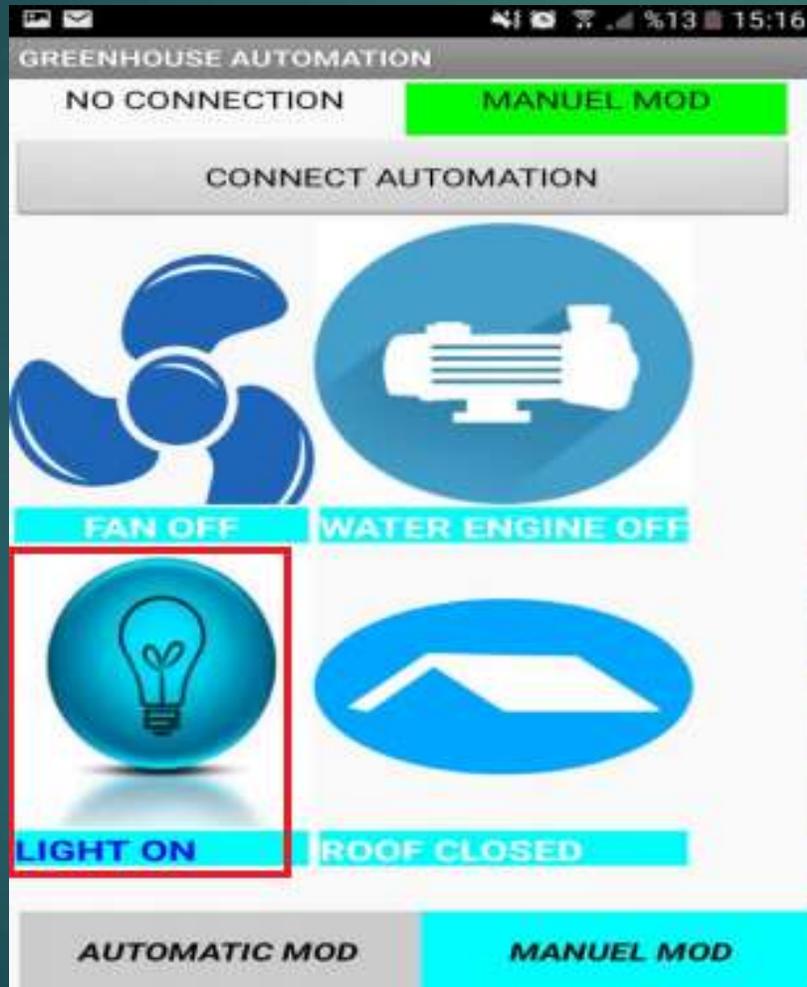
ANALYSIS AND RESULTS

- ▶ Bluetooth client created for the interface to communicate with Arduino. Bluetooth devices suitable for connecting around were displayed with Listpicker. With the block created, the user was informed with the status information on the interface when connected to the Bluetooth device.
- ▶ In the button blocks, it is provided to operate the desired devices by sending the previously determined numbers (1 to 9) to the Arduino with the Bluetooth client. For example, when 2 was sent to Arduino, Arduino sent electricity to the fan and enabled it to work. With the label on the blocks, information such as fan on/off, water engine on /off, roof on/off were presented to the user.

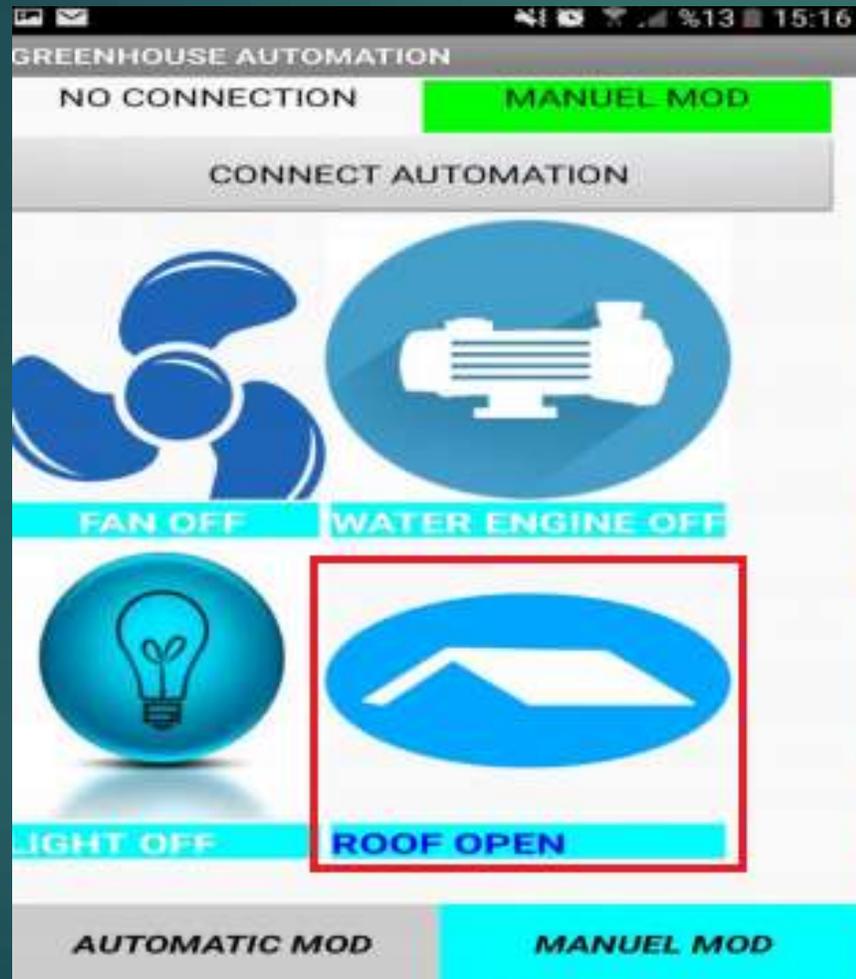
ANALYSIS AND RESULTS



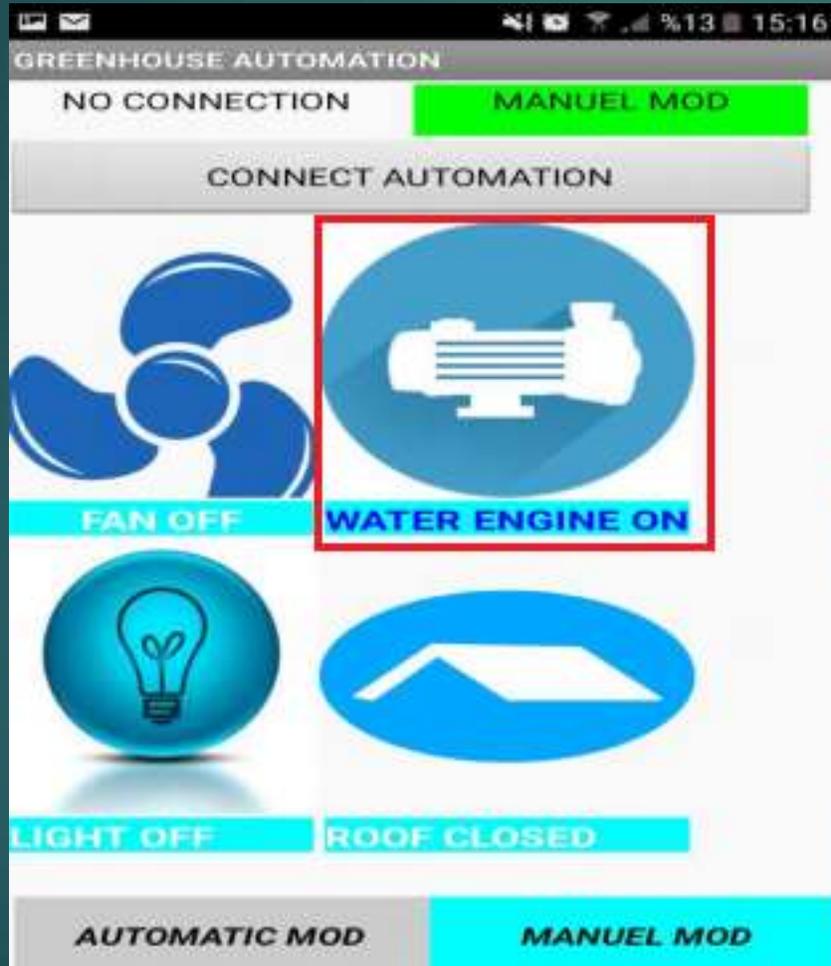
ANALYSIS AND RESULTS



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