

Climate Control System For Cold Storage Depots

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Abstract- Not being able to control and monitor devices makes people lost so much afford and work without even noticed. Loosing some of the harvest because of the weather situations is still normalized in the most countries. With this project cold storage depot projects can be easily supported with IOT for small amount of money. IOT support allows users to monitor data and control things from anywhere using Celular or Wifi internets and automize their storages. This article is explains how this system works.

Keywords Cold Storage Depot , Climate Control System , Temperature , Humidity.

1. Introduction

In the world, agricultural products are grown in different climates and in different periods, but these products are needed every period of year. For this aim these agricultural products are stored in cold storage depot. Among the aims of storing agricultural products are: To be sold later, to preserve the quality of the product, to ensure that the product is available in the market every period of the year [1].

The moisture content and temperature in cold storage depot should be in accordance with the type of product to be preserved. For this reason, it is necessary to control the humidity and temperature ratio in cold room applications and to maintain these ratios. Particular attention should be paid to controlling the volume of the material being cooled, which is cooled to prevent rapid staling / crushing of high water content materials during storage [2].

It is very important to keep values stable such as temperature and humidity in the cold storage depot at fixed positions and to bring them to the fixed values by taking necessary interventions in the changes in these values.

Today in smart home systems [3], in factories and in sera [4], control systems have been developed over internet and mobile.

With the development of technology, the number of applications that provide control from distant points is increasing steadily. Under these applications, different communication protocols such as the Internet are used

depending on the needs such as system installation cost, distance and data transmission speed [5].

In this study, a low-cost and effective climate control system has been developed for instant remote control of cold storage depot In the project, the user can see the current and past temperature humidity values of the cold storage depot If the temperature and humidity surpasses user's desired value user can turn on and off devices such as air conditioning, fan etc. If the user desires, He/she can control it via website or mobile application. Http requests [6] were used to communicate Arduino UNO-connected [7] sensors with the website and mobile application.

2. Project Structure

Project has both electronic and software parts together. Hardware parts are mainly built on Arduino. We use Arduino Uno and Arduino Ethernet Shield for connecting internet, controlling devices and gathering data from sensors. We choose using Ethernet Shield instead of cheaper or Wi-Fi supported devices such as ENJ28J60, ESP8266 has 7 sign leds on it to provide simple as using; "TX" led flashes when the Shield sends data, "RX" flashes when the Shield receive data, "COLL" flashes when the network collisions detected, "FULLD" shows that the internet connection in full duplex , "100M" shows that the 100mbps internet connection, "LINK" shows the presence of a network link and flashes when the shield transmits or receives data "PWR" shows that board and shield are powered.

The presence of a network link and flashes when the shield transmits or receives data, “PWR” shows that board and Shield are powered. The reason is its allows us to keep Rx, TX ports open so system can be updated in the any possible situation which needs to use Rx, TX ports. Ethernet Shield is can be easily powered by Arduino’s itself so it removes the need of use an additional power supply.



Fig. 1. Ethernet shield used in the project.

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DHT21 temperature and humidity sensor is used for the measurement. It Works with 3.3V-5V DC. The output signal is Digital. The measuring range is between -40 to +80 Celsius and %0-100 humidity. -40 Celsius lower limit is the important number for the project. Because most of the products in the cold storage needs temperature between +5 to -10 Celsius to stay fresh and alive and measurement devices needs to measure correctly under that temperature condition.



Fig. 2. DHT21 temperature & humidity sensor.

The relay module in the Project is a module that has 2 relays on it. Its compatible with so many microcontrollers such as Arduino, Raspberry, PIC, ARM and etc.(3) The relay module use one QIANJI JQC-3F high-quality relay with rated load 7A/240VAC, 10A/125VAC, 10A/28VDC.



Fig. 3. Relay module

In the design of the Project we have connected Arduino Uno with Ethernet Shield wired from the mini usb port for program and power both devices. We have set the relay between 12V dc fan and 12V adaptor

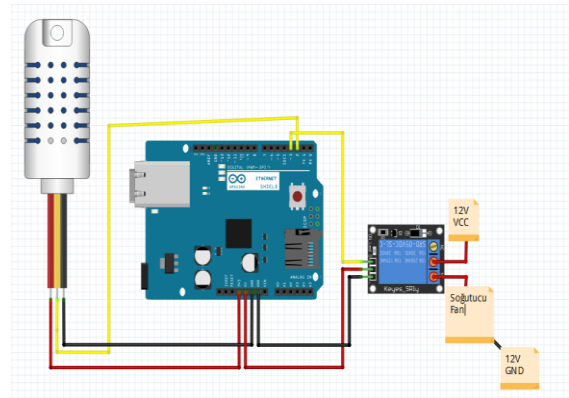


Fig. 4. Design of the Project

3. Software Parts

Basically this project’s goal is reading some data from sensors, gathering, saving those data into server and controlling devices from browsers and mobile devices. To make this Project real 6 Programming/Marking languages used. In Arduino side C is the main programming language that we have used. After C, HTML is needed to build web server on Ethernet Shield. To control devices and gather data from sensors HTTP requests have used. On the server side the website has made with php, html and css, in the database side MySQL is the one that is used for keep sensor data and user information.

Mobile app is powered by Ionic2 framework. In this way app works on both IOS and Android. To programme Ionic2 TypeScript and Angular2 is used.

Temperature / Humidity Values		
Date/Time	Temperature (°C)	Humidity (%)
2017-05-26 02:00:58	23	58
2017-05-25 13:40:37	21	66
2017-05-25 13:39:26	21	66
2017-05-25 13:38:15	21	66
2017-05-25 13:37:05	21	66
2017-05-25 13:35:54	21	65
2017-05-25 13:34:43	21	65
2017-05-25 13:33:32	21	64
2017-05-25 13:32:21	21	64

Fig. 5. Web Page

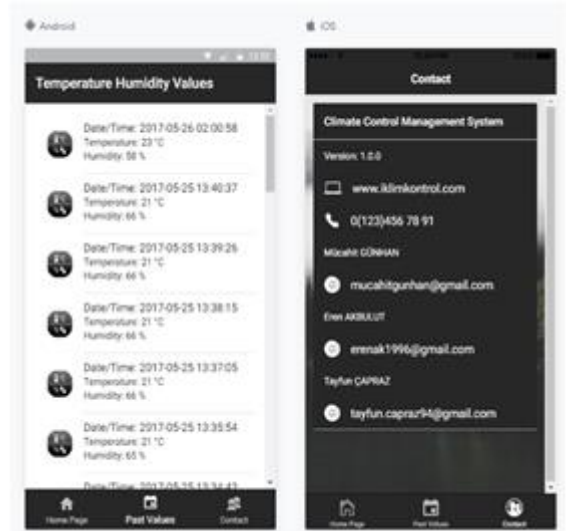
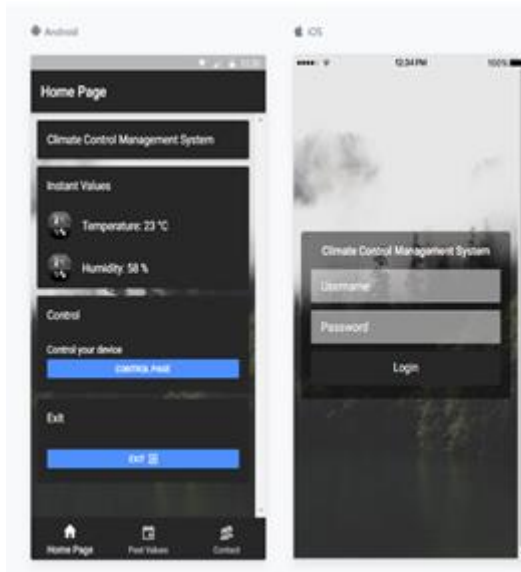


Fig. 6. a.) Main and login pages b.) Past values and Contact pages in developed mobile application.

4. Conclusion

The system made in this study ensures quick, reliable and low cost control on the cold storage depot.

It can be used in new types of cold storage depot as well as old ones

The system can work between -40 degrees and 80 degrees.

A web site and a hybrid mobile application have been designed for the system so it can run smoothly on every platform.

The User can access to devices such as air conditioner, fan , sensors etc. via every computer and mobile device with internet connection.

With both snapshot and storage of the data from the sensors, it is very convenient situation for the user to reach this data in the future and it also helps while make a decision.

With this system, increases the quality of the agricultural products kept in the cold storage depot and They maintains its freshness without deterioration.

As a result, the person who owns agricultural products gain more money than others who don't have this system and also the people who consume these products are fed more healthy agricultural products.

Ongoing the this study the system can be controlled automatically according to the defined temperature and humidity values.

Even when the program is not being used, notifications can be sent to inform the user about the unusual situation.

Authorized people can be informed by the system when the situations like fire.

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