

Temperature and Humidity Monitoring System Using Robot via Smart Phone

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Abstract

Smartphones can be utilized to monitor devices, environment, and production via robotic with high quality control [1]. Today mobile devices application embedded with smart android functions such as GPSs, accelerometers, Humidity and temperature application, high resolution cameras, receivers, and the toxins of the earth identification. This paper introduces the possibility of controlling humidity and temperature using robot via smartphone to assemble information in the area of study and managing the changes of the essential environmental situation. The design of robot was built using Arduino board, whose main component is the ATmega328 microcontroller, which is responsible for the storage of C language control program as well as executing its primary control operation. Furthermore, the smartphone application developed to manage the robot by utilizing the data from various situations that containing high-determination from sensors and a remote transmission for exchanging information to the switches. The Bluetooth technology was selected as a mode of transmission between mobile and robot without Wi-Fi construction. In this paper, an innovative interface between robot and smartphone was integrated via Bluetooth-based sensor to observe temperature and humidity for natural conditions utilizing the android-based cell phone is presented.

Keywords: Robot control, temperature and humidity, Bluetooth, Arduino, Smartphonem.

1. Introduction

Today, cell phones are the prepared gadgets that are utilized as a part of numerous diverse areas, for example, business, health awareness, informal communities, ecological observing, security, and transport. For empowering related application to consider diverse areas, an arrangement of inserted sensors, for example, accelerometer, compass, GPS, mouthpiece, and cam are specifically included to cell phones [2]. The organization of the registering, correspondence, and sensing abilities of the keen sort of cellular telephone empowers participatory or deft operations [3]. Robotics is a branch of technology

that deals with the design, construction, operation, manipulation and application of robots, as well as computer systems for control, sensory feedback and information processing. Robots on the other hand are autonomous or semi-autonomous mechanical agents usually an electro-mechanical machine that are guided by a computer program or an electronic circuitry. Another controversial word “Bot” refers to virtual software agents that act like robots. The history of robotics dates back to the 1st Century AD, during the time of great inventors in the likes of: Philo of Byzantium, Heron of Alexandria, Al-Jazari etc., when the technology was still in its primitive stage, [4]. Today robotic systems are widely used in virtually every industry and in many educational institutions. Robots are created for several purposes, for which measurement, monitoring, safety and security forms a very vital basis for its creation. Several researchers and authors such as: [5] and [6] have been able to discover other more convenient ways to control a robot, such as by using Bluetooth technology.

2. Related Work

A few analysts have created approaches to control valuable systems, for example, temperature humidity, and general environment utilizing direct sensors remotely, because of the developing needs for adaptability, enhanced security, enhanced way of life and the advancement of an industrialized situation [7, 8]. Arduino innovation is developing broadly in created parts of the world, for example, in Europe and America, and is as of late being brought into creating nations. It's developing relevance and simplicity of re-adjustment as expressed in [9], for the individuals who decide to investigate the Arduino segment and different approaches to utilize it has prompted a developing interest for the gadget. Remote correspondence involves the exchange of data starting with one point then onto the next without the utilization of an electrical

transmitter line as characterized in [10]. It utilizes electromagnetic waves as its method for correspondence; the adaptability of this method for data exchange or imparting has made it extremely basic in the current environment. There are different modes of remote communications, for example, radio correspondence, microwave correspondence, obvious light and infra-red modes, sonic mode and by electromagnetic prompting, as connected in [11] where Ethernet and Bluetooth shields are utilized and as a part of [12] where infra- red is utilized.

Bluetooth is a wireless technology standard for exchanging data over short distances using radio transmission with a wavelength in the Industrial Scientific and Medical Band (ISM band- form 2400 – 2480MHz) from fixed and mobile devices, creating Personal Area Networks (PANs) with high level of security. This technology has become very common these days in both domestic (between two phones/ a phone and a personal computer/ two personal computers) and industrial applications. In industries they are not only used in the domestic form, as in, usual file transfer, they are also used to control actuator/robots interfaced with Bluetooth devices, which could be used in small scale production or monitoring by the transmission of data between a controller and an actuator.

This study integrated hardware implementation and software programming section. The hardware implementation of robot design was required to use an Arduino hardware Uno board, a Bluetooth control module, an X-bee shield, an Ethernet shield, a 2A motor driver, direct current motors, infra-red and humidity sensors, a 2x16 LCD display, an FM transmitter, a dark sensor, an already made toy car base with tires, and some additional fabrications to support extra components being used in this study. The building program done based on C++ language, while the software section which entails the creation of a simple Android application was done MIT Andriod application.

3. Methodology

At the point when investigating and creating portable robots, the most extreme contemplations within the outline of the mechanical device intersection, for example, the physical steadiness of the robot regarding its structure, proficient velocity controllability, and the approaches to minimize the impact of powers contradicting the movement of the robot and the capacity of the chose segments to gauge natural conditions precisely. This robot

accompanies another era sensor (HR202 and LM35) produced using macromolecule materials to quantify relative mugginess and temperature individually. The highlights of this robot include: a locally available comparator for advanced yield, a force pointer LED, an installed potentiometer for level alteration, a simple yield voltage for estimation. Fig 1 demonstrates a specimen of the predefine design on the breadboard for adjusted moistness perusing on LCD The motor shield as shown in Fig 2 shows the drive of two channel DC motor using Arduino kids. It makes use of IC L293D which has the capacity to deliver as much as 1.2A current to each channel. It controls speed by either pulse width modulation (PWM) and performs direction control functions by regulating the supply voltage. Its features include: a 5V logic control voltage (from Arduino for the enable pins), a motor driving voltage of 4.8V to 36V which could be supplied by using an external source which is usually preferred; a logic supply current Iss of 60mA, a motor driving current Io of 1.2A, a maximum power consumption of 5W within the -40°C-150°C range and pulse width modulation/phase locked loop control modes.

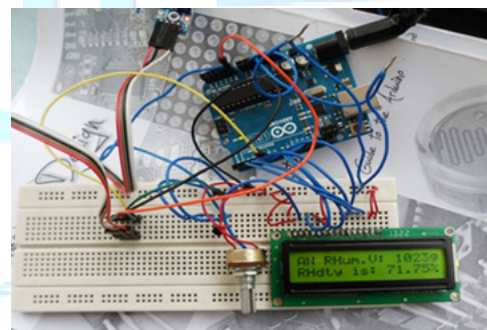


Fig. 1 Modified humidity reaing on LCD

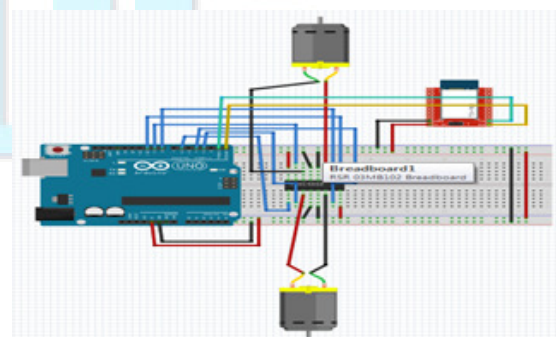


Fig. 2 Complete circuit set connected to Arduino board

As with many other concepts been done to control the robot, it also has disadvantages such as: security threats resulting from a fixed scope of applicability or system errors, unforeseen cost of development or customization of an automated system to suit a particular purpose, a high initial procurement cost and increasing unemployment as in [12]. In like sense it is faced with one basic limitation; not all processes have been automated presently for several reasons. Referring to the values of temperature for relative deviation above, it could easily be concluded that the sensors are efficient, since their output reading are close the standard reading. Fig 3 demonstrates the side perspective of physical robot outline and prepared for testing utilizing the created application by the advanced cell.

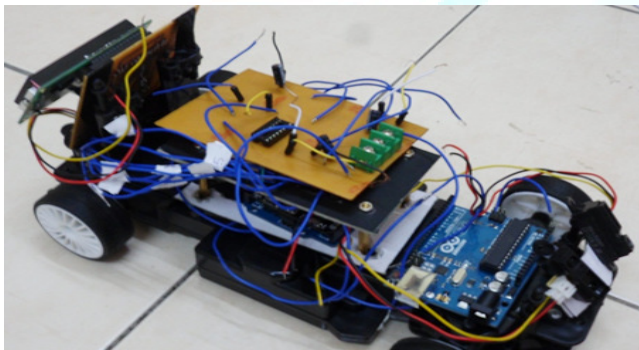


Fig. 3 Side view of the initial robot control

4. Results and Discussion

The basic processes involved in the design of the software are illustrated using Android application development (MIT appinventor) and it is simplest to understand, since its design steps and tools are made very simple to make way for a considerable sympathetic within a short period of time. The window appearance of the software was done in the design environment; the decision to use a two screen interface namely: screen 1 and control screen, it was made to ease coding of the app in the block editor environment. When the window appearance of the app was completed as shown in Fig 4, the behavior of each component used to design the app, was then described in the block editor using a blocks coding system; unlike conventional coding, the

blocks coding system is very different as all those normally long codes are been made into blocks, which are organized to describe the resulting behavior of the app. Test of the connection between the mobile robot and the smart phone application showed that signals could be sent with in sixteen meters (16m) only in free space area, but the value cut down to about twelve meters (12m) when its operation tested in a cornered area with few obstacles as shown in table 1. Fig 5 and 6 shows the comparison between the measurement and the ready-made application in android phone for temperature and humidity respectively. The output signals of the IR sensors are programmed to automatically alter the direction of the robot when an obstacle at close range is encountered, whether it's in automatic or controlled mode.

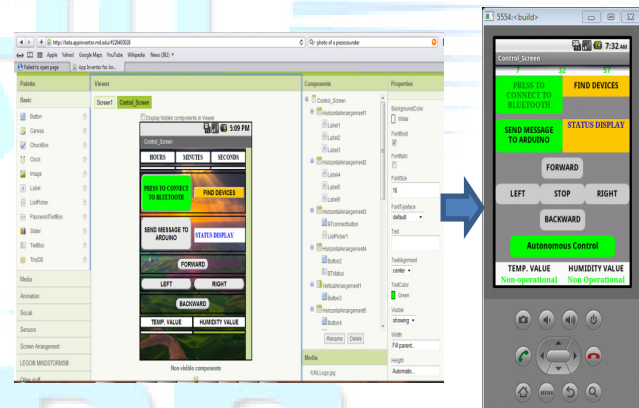


Fig. 4 Main software appearances in smartphone

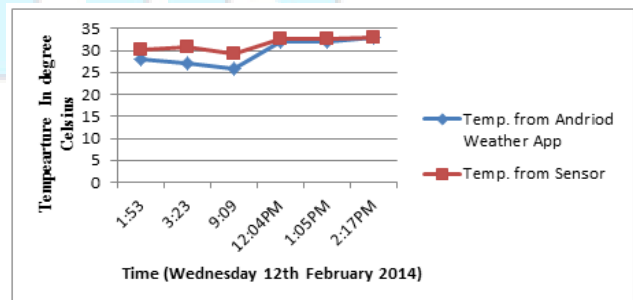


Fig. 5 Comparing Temperature Values from apps with that of the LM35 sensor

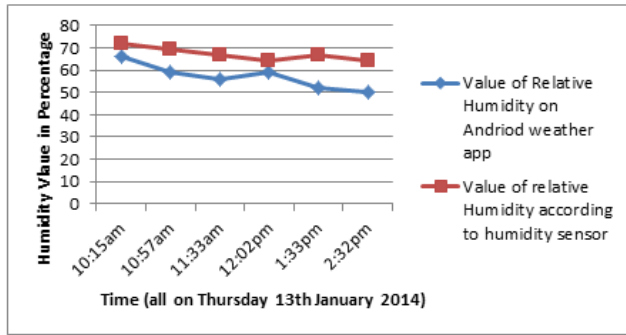


Fig. 6 Values of Relative Humidity from the Andriod app and the Humidity Sensor

Table 1: Magnitude of distances of obstacles

Distance reading from Infra-red sensor in centimeters (cm)	Distance reading on ruler centimeters (cm)
3.2000	3.5
8.0000	10.5
6.0000	8.50
13.3000	17.0
17.9000	21.5
12.0000	16.0
11.3000	15.0
8.6200	11.5
7.3000	10.0
5.5000	7.0
3.7000	5.0

4. Conclusions

This paper discussed the control system of temperature and humidity using robot mobile. The Bluetooth controlled portable robot with advanced mobile phone was effectively made and all focused on destinations were accomplished. With this robot the estimations of temperature and stickiness of a predefined or specific range were proficiently measured. The execution of the different goals of this study has served to enhance the measuring of different prerequisites of temperature and dampness when building a framework with touchy improvement identified with stickiness and temperature. The deliberate esteem by the robot and evaluated quality from android application were essentially associated. These results achieved from robot and smartphone simulator which characterizes the best possible control and case for computing.

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