

Robot for Agriculture Controlled by Smart Phone

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Abstract

Nowadays the robot technology plays an important role in the agriculture system by adding product values of quality. Wireless sensors in wide-area agriculture are applications used to handle a series of technical difficulties in information technology. This research proposed a model for robots with wireless sensors for agricultural tracking and notification. The sensors and microcontrollers are successfully interfaced with NodeMCU and wireless communication is achieved among various Nodes. The Microcontroller receives many data from the sensors and send out data on WiFi. Users can view transferred data with a mobile device or smart phone.

***Keywords:** Robot, agriculture control, smart phone, tracking, notification*

1. Introduction and Literature Review

There has been extensive research into Web Controlled Surveillance Robot designed to enter risky zones and convey data on surroundings to a remote server (Ghosh et al., 2015). Shruti, Jaishetty & Patil (2016) focused their work on implementing a robotic home security system using image a processing technique for intruder detection. Sivamani, Bae & Cho (2013) studied robot movement, signboard recognition, face detection and notification techniques. Gondchawar & Kawitkar (2017) reported their research on WI- FI Based Robot Controlling by Webpage Interface and Video Monitoring by designing of the system with physical components, sensors, embedded system and decision algorithm.

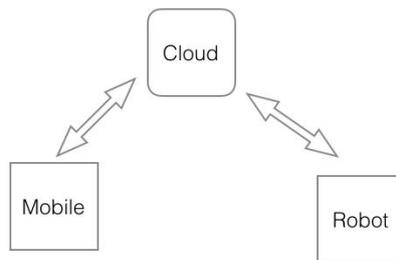
Dumbre (2015) studied Robotic Vehicle Control. In his work, the Internet via Webpage and Keyboard served as surveillance cameras in some areas. The robotic vehicle was controlled via the Internet thus covering large survey areas. Roham (2015) worked on automatically controlling surface transitions, and provided the controlling user with surveillance of location. Chavan & Karande (2014) reported RASPBERRY Pi BASED OBSTACLE AVOIDING ROBOT; it was an autonomous robot using raspberry pi as a processing chip. An HD camera was used to provide and detect the obstacle from the real world to the robot Swathi V1. Vyas, Borole & Singh (2016) studied Disaster Autonomous Robot - Finding People through Face Detection Using ARM-11, and presented the implementation of an autonomous mobile robot, capable of avoiding obstacles and identifying human faces and human bodies. Rattananimit & Pittayaporn (2015) further studied Raspberry Pi Based Human Face Detection on finding whether or not there are any faces in a given image and, if present, returns the image location and content of each face. The study design and implementation of an autonomous car using Raspberry Pi was to build a monocular vision autonomous car prototype using Raspberry Pi as a processing chip. An HD camera along with an ultrasonic sensor was used to provide necessary data from the real world to the car. Vyas, Borole & Singh (2014) and

Ghosh et al (2015) reported their research into smart Agriculture Monitoring and Data Acquisition System with field signal system monitored by a wireless sensor network (WSN). The network integrated different platforms with different communication technology devices in monitoring agriculture field with different sensors using raspberry pi and Arduino or LPC 2148 or AVR based microcontroller. Its implementation compared real time and historical data. Roham (2015) also worked on Smart Farm using Wireless Sensor Networks (WSN) to cover vast areas of application and to automate and analyze the corresponding parameters. Such works have led to development of the Web Application, Smartphone Application, Sensor Network using Zigbee Devices, BeagleBone Controller and various Sensors.

2. Methodology

In this section, the researcher described the Robot used on the user’s device with the application of the robot’s device. On the robot, a Wi-Fi module was mounted and interfaced with a Raspberry Pi as shown in Figure 1. The controller was a client sitting on a computer or a laptop in range of Wi-Fi administering the robot. Whenever the client sends the control signal, it was transmitted wirelessly and captured by the Wi-Fi module mounted on the robot. This signal was transmitted to Raspberry Pi attached to it.

Figure 1: System Overview



Raspberry Pi analyzed the signal to take an appropriate action to rotate the motor i.e., either clockwise or anti-clockwise. Due to this, the researcher was able to control the movement of the robot either going forward or moving backward, in the left or right directions.(Ghosh, 2015). Keys pattern were designed on a webpage through which the robot was controlled as shown in Figure 2 (Ghosh, 2015).

Figure 2: GUI Controller (Ghosh, 2015)

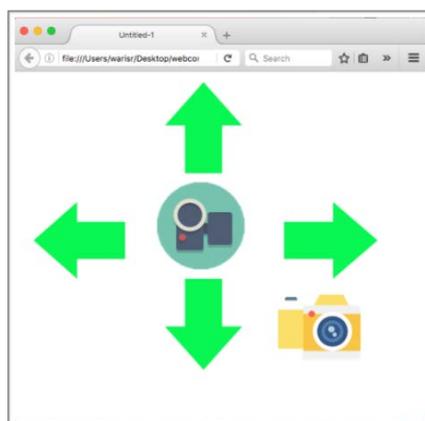
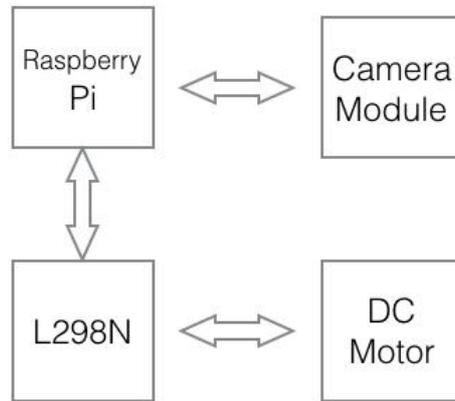


Figure 3: Diagram Robot Control



3. The results

As shown in Figure, Raspberry Pi is the heart of the system including Wi- Fi Technology. The Motor Server is run by the User. Monitoring the video, the user maneuvers the robotic vehicle or the robotic arm accordingly. This is done by making High or Low the desired GPIO pins of the Raspberry Pi. Figure 4 GPIO pins are connected to the 4 servo motors and 4 to the motor driver IC 1298Nf (Dumbre, 2015).

Figure 4: Circuit Diagram Motor Control with IC

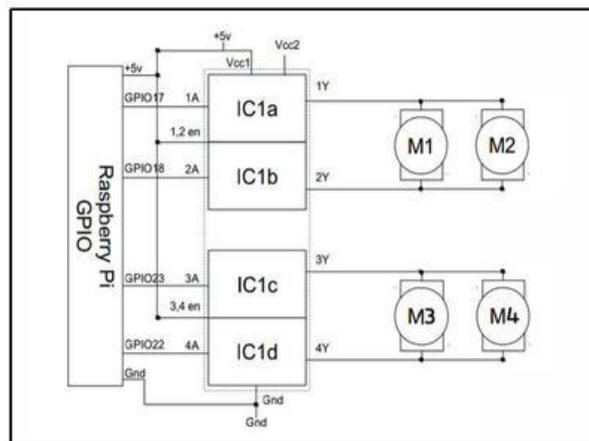


Figure 5: IC L298N Logic Table for Control Motor

Enable	L1	L2	Result
L	L	L	OFF
L	L	H	OFF
L	H	L	OFF
L	H	H	OFF
H	L	L	BRAKE
H	L	H	FORWARD
H	H	L	BACKWARD
H	H	H	BRAKE
H	L	L	BRAKE
H	PWM	H	FWD-SPD
H	PWM	L	BCK-SPD
H	H	H	BRAKE

Enable	L3	L4	Result
L	L	L	OFF
L	L	H	OFF
L	H	L	OFF
L	H	H	OFF
H	L	L	BRAKE
H	L	H	FORWARD
H	H	L	BACKWARD
H	H	H	BRAKE
H	L	L	BRAKE
H	PWM	H	FWD-SPD
H	PWM	L	BCK-SPD
H	H	H	BRAKE

Raspberry Pi receives the signal from Wi- Fi Module; it decodes the signals using the code which is burned in the Raspberry Pi. The different signals are for Forward, Reverse, Right and Left motions of the vehicle (see Figure 5) and the signal for video transmission.

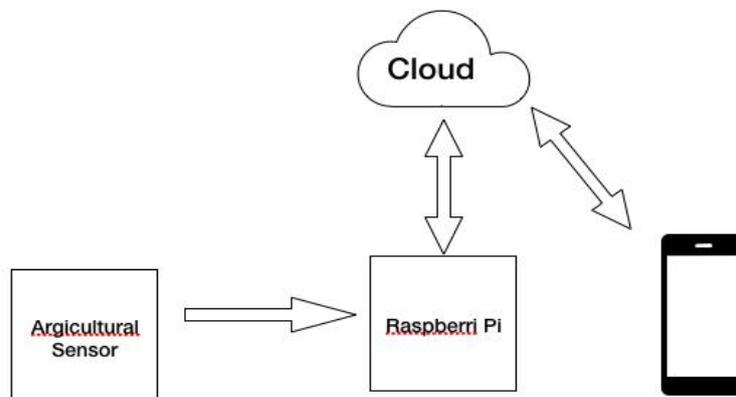
Figure 6: The Robot



Controlling the movement of the Robot can be done by using a remote control interface. It could be a web interface; it is recommended to use a mobile based user interface for controlling the car motion. It should be noted that using PHP and Python can change any GPIO port of the raspberry to input or output. Also it is easy to send a high and low signal on any port specified just by sending a GET and POST request. Though it may be useful for one who can ignore the delay but it is not considered an effective approach in controlling the motion of the car.

The agriculture part consists of sensors (for temperature, moisture and the light), which are installed in the Robot Arm and Body. These sensors are to collect the environmental parameters. The sensed data are mitigated into the cloud through a mobile device or a smart phone.

Figure 7: Agricultural Sensor with Cloud



4. Conclusion

The researcher developed a robot utilizing the user's device with the application of the robot's device. The researcher noted that using PHP and Python can change any GPIO port of the raspberry Pi to input or output. However, it was easy to send a high and low signal on any port specified just by sending a GET and POST request. The researcher reported the agriculture part comprising sensors for temperature, moisture and the light, installed in the Robot Arm and Body. These sensors were to collect the environmental parameters and all sensed data were mitigated into the cloud through a mobile device.

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Waris Rattanimit is a full-time lecturer in the Department of Computer Technology Faculty of Engineering and Technology, Siam Technology College, Bangkok, Thailand. He has research interest in robotics and information technology as applied to agricultural practices and innovations.

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