

New Approach to Plant Protection and Pest Control using Raspberri Pi

Swati Gunjal, Manoj Kumar Singh

Abstract— Country like India whose economy is dependent on agricultural business has immense importance of farming business. But sadly this business is not that much beneficial due to various reasons. Resulting in suicide of farmers. One of reason of failure is pest attacks on farms. Pest produces large amount of damage to farms. In proposed system the mathematical model Beta regression analysis is implemented using raspberri pi. Inputs to beta regression mathematical model are humidity and temperature at farm. Beta regression analysis predicts the environmental situation responsible for pest formation and attack. Output of this mathematical model is beta regression factor. Beta regression factor is risk indicator for environmental health. Depending on risk factor pest prediction is done. With prior prediction farmers can use appropriate amount of pesticides to avoid pest over farms. With accurate prediction of pest control farmers can avoid damage happening after pest formation.

Index Terms—IoT-Internet of Things, Rpi-Raspberri Pi, BRMA- Beta regression mathematical analysis.

I. INTRODUCTION

Indian economy is characterized by Agro based businesses. Seventy percent of its population is dependent on agricultural businesses. Looking at large amount of population dependent on agricultural businesses it's obvious that GDP also widely dependent on agricultural businesses. Hence the issues related a farmer has immense importance at Indian economy. Increasing suicides are serious concern to be tackled. In proposed system one of factor causing harm to farms is tackled. The said issue is pest formation at plants or farms. It is necessary to understand that pest formation happens mainly due to environmental change factors. Due to global warming this issue has been raised its concern heavily. Proposed system is integrated with embedded server system for added advantage. Embedded web server system is dependent on embedded controllers like raspberri pi begalebone these controllers provides necessary ports to access Ethernet or internet. This facility can be utilized to create a network for accessing the desired data in proposed system the same concept has been implemented for proposed embedded with server. The raspberri pi as a controller is used. Raspberri pi has advantage over begalebone in terms of number of ports power consumption and speed. that is why the raspberri pi is selected as a controller. Depending on number of IP addresses provided by router the propose system can give access to number of clients. here in proposed system web page is used to access the data from field using

different sensors. These sensors are humidity sensor and temperature sensor. The proposed system is divided into two parts. At first part light dependent sensor and LM 35 both light sensor and temperature sensor respectively used as an outer environmental sensor. These sensors collect data for outer region of farm. In second part humidity sensor that is dht11 is generally used as moisture as well as temperature sensor. With dht11 the proposed system collects humidity and temperature data for calculating regression factor .In first part as well as second part sensors sends data to raspberri pi. In case of analog sensors the data is sent through analog to digital converter. Here MCP 3008 is used as an ADC. The sensors in first part are analog sensors. In second part the sensor dht11 is digital sensor, it doesn't require analogue to digital sensor. The Sent data at raspberri pi is flashed on the webpage using a web server system.

II. LITERATURE REVIEW

A. Embedded Web Server

Embedded web server has its own importance. Generally it is used for dedicated purpose system. In dedicated purpose system the application is fixed according to the end users. It has specific task to be accomplished repeatedly on the same concept in proposed system embedded web server is used here. Apache server is used for implementation of embedded web server using raspberri pi. There are different types of servers available for implementation of embedded web server. For accessing embedded web server web page is created using PHP. The communication between embedded web server and client is created using internet protocol, Serial peripheral protocol. For implementation of embedded web server root location of raspberri pi is utilized. Embedded web server can be accessed by only authorized clients having IP addresses of dedicated network provided by router.

B. Raspberri Pi

In new trend of embedded system world, the controllers having facility of installation of operating system is quite popular. It is due to faster speed, easy access, easy programming and operating as compared to traditional controllers. As in embedded web server system internet, Ethernet has major role, the Ethernet port provided by raspberri pi has great task to perform. With Ghz frequency raspberri pi shows very less delay in data transmission and reception. Raspberri pi includes ARM cortex and Ethernet IC for better operation and control.

C. Beta regression analysis

The mathematical model beta regression analysis is used to Calculate regression factor. Regression factor is nothing but Risk indicator of environment. The regression factor can be calculated using equation no.1.

$$\log(y)=\log(\alpha)+\beta\log(t)+\gamma\log(1-t)+\delta\log(H) \quad (1)$$

Where,

y = Regression factor

H= Humidity

$\alpha, \beta, \gamma, \delta$, are constants varying for different crops according to their ideal environmental conditions.

While t is temperature defined by equation no.2

$$t=(T-T_{min}) / (T_{max}-T_{min}) \quad (2)$$

Depending upon regression factor severity index is defined for pest formation. Table no.1 describes severity index range.

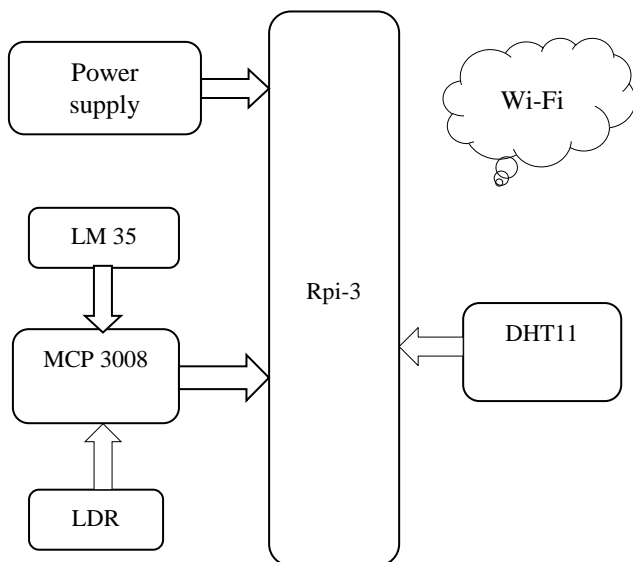
Range of Y	Severity index
< .0.5	Low risk
0.5<Y<1	Moderate risk
>1	High risk

Table 1. Severity index ranges

III. SYSTEM DEVELOPMENT

A. Block diagram

1. Transmitter



2. Receiver

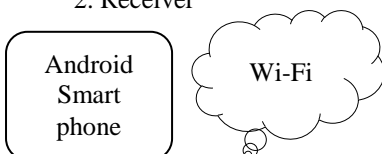


Figure.1 Proposed System

The proposed system in figure no. 1 consists of transmitter and receiver. At transmitter side embedded web server designed with raspberry pi and sensors are placed at field while at receiver end user can use android mobile, Laptop, Computer, Tablet. User can access embedded webserver through web page designed in .php language. For sensor reading python language is utilized. All the sensor parameters and regression factor is displayed over webpage. The proposed system uses DHCP server for IP address service.

B. Algorithm

1. Start
2. Initialize raspberry pi.
3. Check input signal from DHT 11 & ADC.
4. Go to step 11 if there is no signal from DHT 11&ADC .
5. Solve beta regression model.
6. Send sensor parameters and disease forecast (Risk Factor) to web page.
7. Display Sensors parameters and forecast on web page.
8. If Risk factor is HIGH then go to step 9 else go to step 10
9. Make Relay 1 and Relay 3 ON
10. Make Relay 2 ON & Make Relay 1 and Relay 3 OFF
11. Wait for 5 second after that go to step 3

C. Flow chart

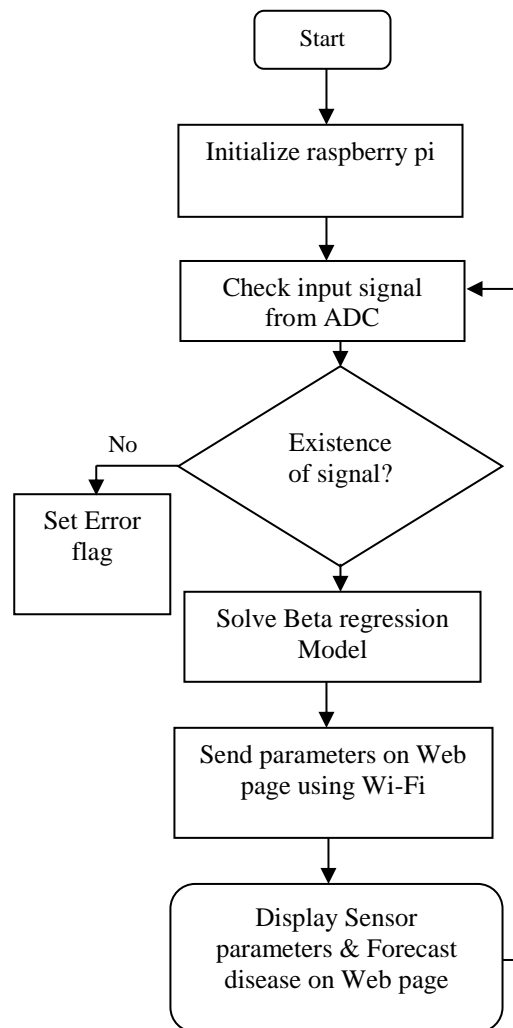


Figure.2 Flow chart of proposed system

As shown in figure no.3 Overall flow of proposed system is shown. It clarifies the idea of proposed system.

IV. RESULTS AND CONCLUSION

The proposed system is successfully implemented using raspberry pi and different sensors. As shown in Figure.2 IoT based monitoring web page is also working effectively.

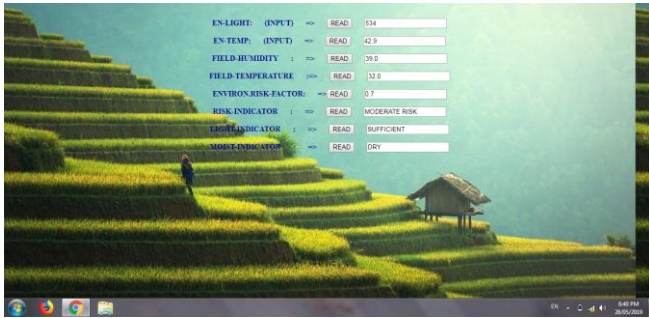


Figure.2 Monitoring Web Page

Real time test shows following result mentioned in table.1

S.n.	Regression Factor	Risk Indicator
1.	0.4	Low
2.	0.6	Moderate
3.	0.9	Moderate
4.	1.1	High

Table.2 Result Analysis

At real time test it is found that proposed system has very less time lag. It makes it so fast as compared to other controllers and existing system. Prediction of pest using regression factor is definitely helpful for farmers' to avoid their crop loss.

REFERENCES

- [1] Manivannan M and Kumaresan N "Embedded web server& GPRS based Advanced Industrial Automation using Linux RTOS" ,*International Journal of Engineering Science and Technology* Vol. 2(11), 2010, 6074-6081
- [2] Clyde C. W. Robson, Samuel Silverstein, and Christian Bohm ,”An Operation-Server Based Data Acquisition System Architecture” *IEEE Transaction on Nuclear Science*, 2010, Vol. 55, No.1.
- [3] Krithi Ramamritham, John A. Stankovic, “Scheduling Algorithms and Operating Systems Support for Real-Time Systems”, *Proceedings of IEEE*, 1994,vol. 82, No. 1, pp. 55-67.
- [4] Silverstein.S.B, Rosenqvist.J, and Bohm.C, “A simple Linux-based platform for rapid prototyping of experimental control systems”, *IEEE Transaction on Nuclear Science* vol. 53, no. 3, pp. 927–929
- [5] Li,S,Jiarong.R.Luo,Yichun.C.Wu,Guiming.M.Li,FengWang,andYong Wang, “Continuous and Real-Time Data Acquisition Embedded System for EAST”, *IEEE Transaction on Nuclear Science*,2010,Vol.57,No.2,
- [6] Li J,Zhang B, Qiu D.Y, “Multi-computer communication based on Modbus RTU in power quality monitoring system”. *Electric Power Automation Equipment*, 2007 Vol.27,(1):93-96.

Miss. Swati Gunjal has completed her BE E&TC and now pursuing ME in VLSI and Embedded from Sahyadri Valley College of Engineering and Technology,Rajuri,Dist.Pune,Maharashtra,India.
Email Id. swatigunjal27@gmail.com

Mr. Manoj Kumar Singh Completed ME In Digital Electronics, Working As an Assistant Professor at SVCET, Rajuri, Maharashtra,India.
Email Id. manojkumar1985.111@rediffmail.com