ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 3, March 2017

A Novel Hardware Implementation of Forest Fire Detection Using MYRIO

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ABSTRACT: This work proposes a novel hardware implementation of forest fire detection with MYRIO is presented. The system contains two blocks namely transmitter and receiver. In transmitter block solar Panel, Controller, Battery, MYRIO, Global Positioning System (GPS), and flame sensors are used. Receiver section PC with labVIEW to be connected with alarm. Flame sensors are used to sense the Fire within the range of 10 metre. GPS is Externally Connected with MYRIO. GPS Fetched the information of fire affected areas is sent MYRIO Protocol. MYRIO Protocol it acts as a wireless sensor medium and also receives the Forest affected areas information from GPS, it sends to the receiver section. Receiver section receives the message were monitored by using lab view and it enables the alarm which has connected to the external port, immediately the information send to nearest headquarters. By using LabVIEW we are obtain the collective report of forest fire affected areas by each district. The hardware and simulation of proposed method is validated under LabVIEW with myRIO sensor networks and the performances are obtained.

KEYWORDS: Solar Panel, Controller, Battery, MYRIO, Global Positioning System (GPS), and flame sensors

I. INTRODUCTION

Forest resources are important resources for all living things in the world. Around 1/3 rd of the world's land areas is forest. Forests are provides renewable resources for this earth. Covering the earth like a green blanket these forests not only produce innumerable material goods, but also provide several environmental services which are essential for life. Forested watersheds act like giant sponges, absorbing the rainfall, slowing down the run off and slowly releasing the water for recharge of springs. Increasing demands for fuel wood by the growing population in India alone has shooted up to 300-500 million tones in 2001 as compared to just 65 million tones during independence, thereby increasing the pressure on forests. Wood for making boxes, furniture, railway-sleepers, plywood, match-boxes, pulp for paper industry etc., have exerted tremendous pressure on forests. Forests are the homes of millions of wild animals and plants. About 7 million species are found in the tropical forests alone. About 50-80% of the moisture in the air above tropical forests comes from their transpiration which helps in bringing rains. It can absorb many toxic gases can help in keeping the air pure. They have also been reported to absorb noise and thus help in preventing air and noise pollution. The term forest fire refers to drastic elimination of forest resources due to many natural and man- made activities. The total forest area of the world in 1900 was estimated to be 7,000 million hectares which was reduced to 2890 million hectares by 2000.

II. RELATED WORK

There are many number of papers that have been published and some author discussed about various techniques to detection and controlling the fire & Conservation of plants and habitat. The proposed method Experiences an optimal fire detection using wireless sensor nodes using Lab view. The proposed method hardware implementation is validated under Lab view and information exchange through the transmitter and receiver implemented with MYRIO PROTOCOL. Fire alarm to be enclosed with receiver to alert. Lab view is software tool

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mainly used to monitor the total no of areas affected by Forest fire and with the help of lab view software we can take Annual report of forest fire affected areas by each state and district.

III.BLOCK DIAGERAM OF PROPOSED METHOD

Figure.1 Shows the Block Diagram of Proposed Method. The Block Diagram Consists of two Sections one is Forest Area and another one is monitoring Area. In Forest Area Solar panel, Charge Controller, Battery, MYRIO, GPS, Flame Sensor are connected in transmitter channel. Solar Panel gets Maximum power through Sun using MPPT Algorithm [1][2]. The output of the solar Panel is 20V. The Output voltage is stored using a Battery with the help of charge controller. Charge controller used to maintain the voltage level 12V.

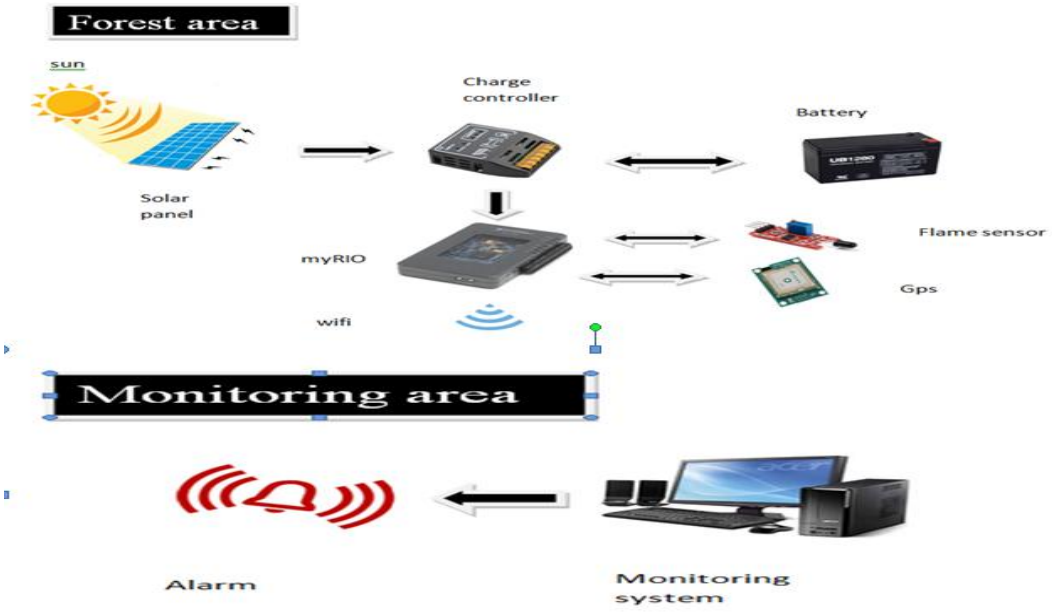

Figure.3. Block Diagram of Proposed Method

The Forest Area affected by the wild fire is sensed using flame sensors and it also senses the temperature level, values are given to MYRIO Port [10]. In receiver Channel smart Monitoring System (PC with lab view) and alarm is Connected to the Monitoring Area. MYRIO transmits the location of the affected Forest to monitoring section. Monitoring Section immediately gets the Geography of the affected location with the help of Google earth. The lab view monitoring section sends the fire alert message and also sends the location to nearest forest head office which is stored by MYRIO port [10].

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IV.HARDWARE IMPLEMNTATION

I. Solar Panel:

Figure 2. Solar panel

Table 1. Specifications of Solar panel

s.no	Specifications	Ratings
1	Rated power (pmax):	20W(0~+3%)
2	Open circuit voltage(voc)	21.5V
3	Short circuit current(Isc)	1.30A
4	Voltage at max power(Vmp)	17.7V
5	Current at max power(Imp)	1.13A
6	Max system voltage	600v

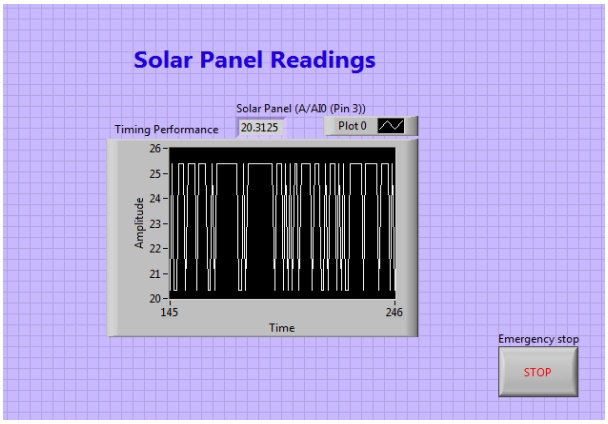

Figure.3. lab view model for Solar panel

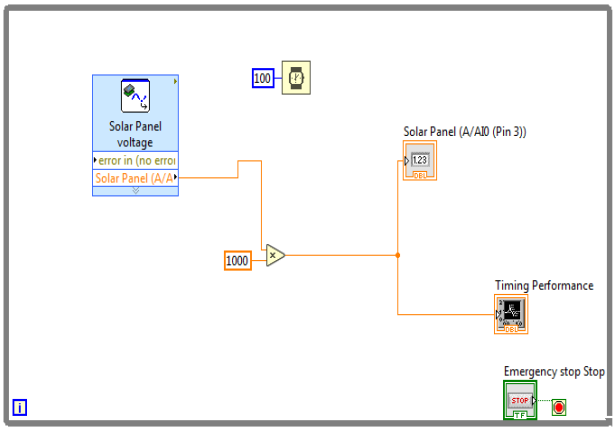

Figure.4. lab view output for Solar panel

The figure 3 & 4 shows the lab view model and output for solar panel. The Solar Panel with Simulation is validated under lab view. This circuit Contains Solar panel its Produces the voltage 20.3V by using MPPT algorithm.. DC Input voltage of 46V irradiation is given to Solar Panel. Solar panel radiates the maximum voltage and connected to Charge Controller. Charge Controller regulates the voltage and it stored into battery.

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II. Charge Controller:

Figure.5. Hardware Circuit for Charge Controller

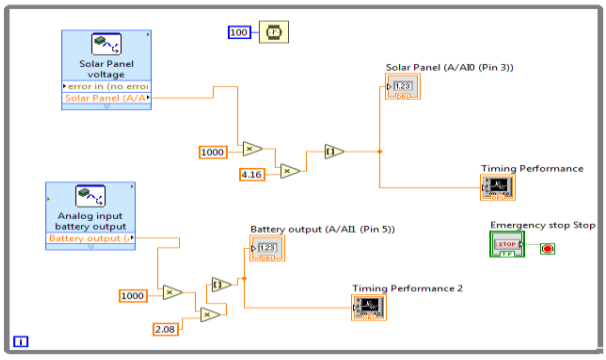

Figure.6. LabVIEW model for Charge Controller

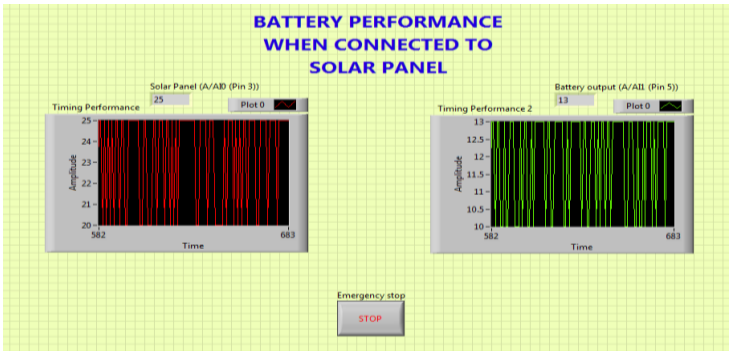

Figure.7. LabVIEW output for Charge Controller

Figure 5. Shows the hardware Circuit for Charge Controller. Charge Controller based on the working of Buck –Boost DC-DC converter. The solar panel output of the 21V is given to Charge Controller. Buck- Boost Convertyes are maintaining the Maximum Voltage level is 12V. Figure 6 & Figure 7 shows the Lab view model and output for Charge Controller.

III.Flame Sensor:

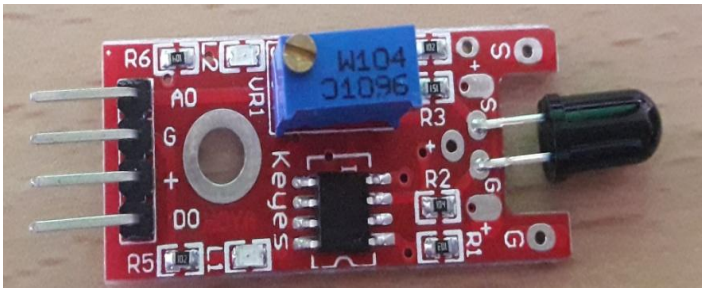

Figure.8. Hardware Circuit for Flame Sensor

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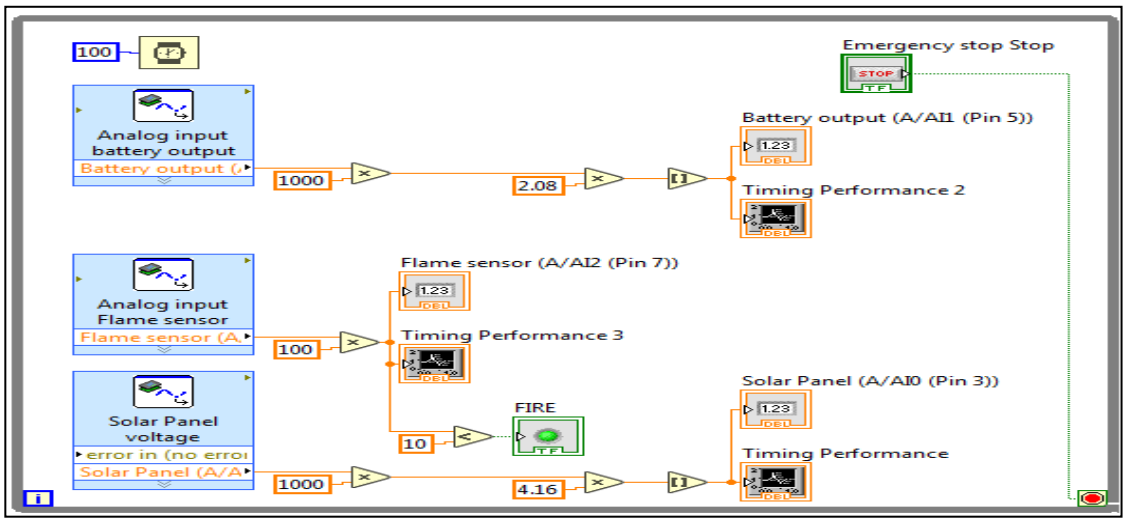

Figure.9. LabVIEW model for Flame Sensor

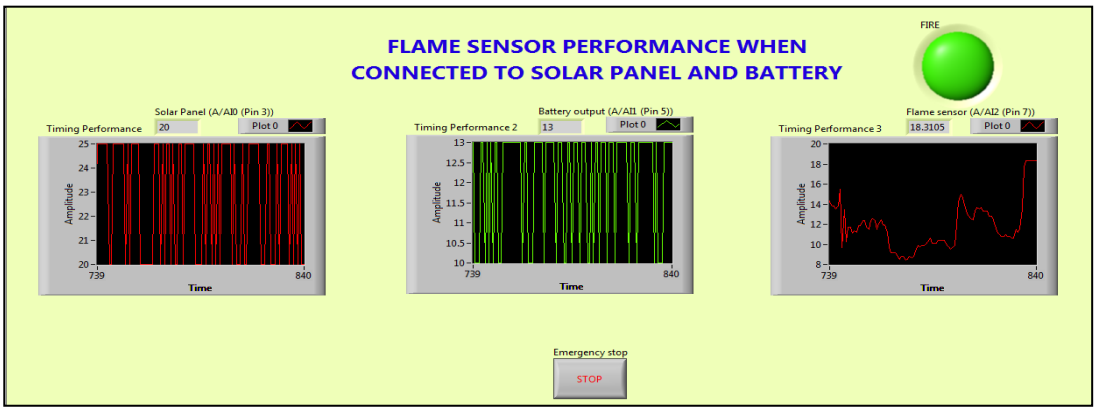

Figure.10. LabVIEW output for when the Fire is Detected

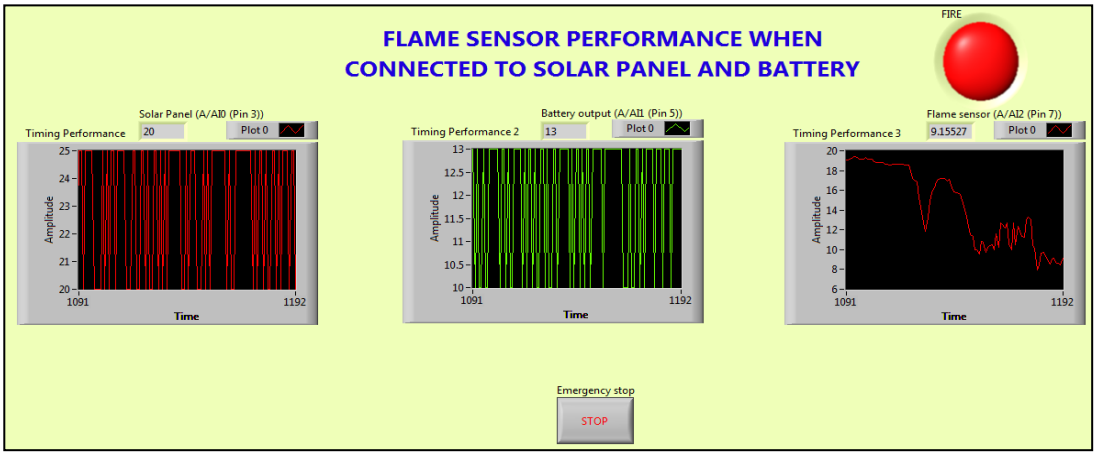

Figure.11. LabVIEW output for when the Fire is not Detected

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ISSN (Print): 2320-9798

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Figure 8 shows the hardware Circuit for flame sensor. It contains analog output, potentiometer, Comparator Chip. Figure 9 & 10, 11 shows the LabVIEW modelling and output for when the fire is detected with flame sensor and when is not detected with flame sensor (Normal Condition). The performance of the flame sensor can be monitored by using LabVIEW.

V.EXPERIMENTAL RESULTS

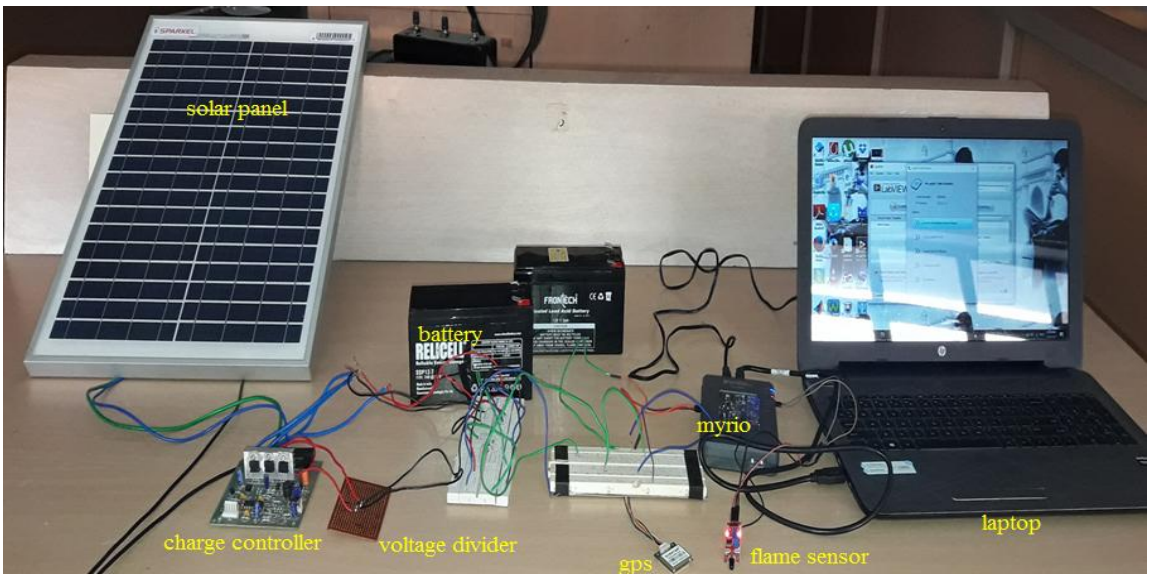

Figure.12. Experimental Setup for Proposed Method

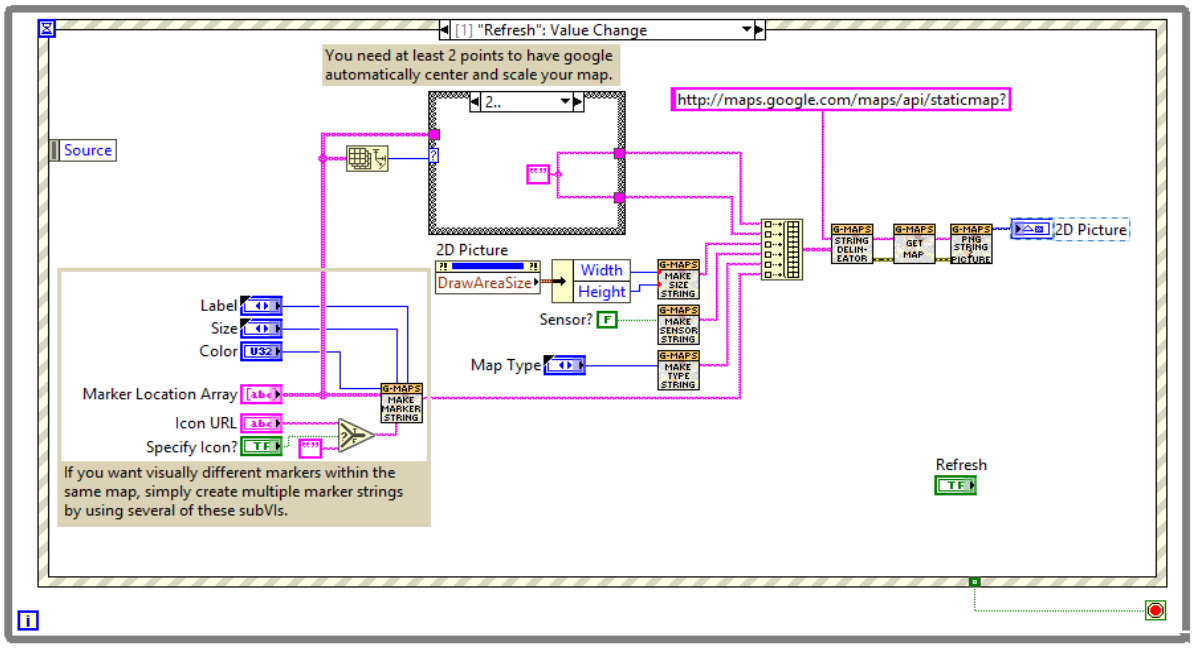

Figure.13. LabVIEW model for Location path finding

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 3, March 2017

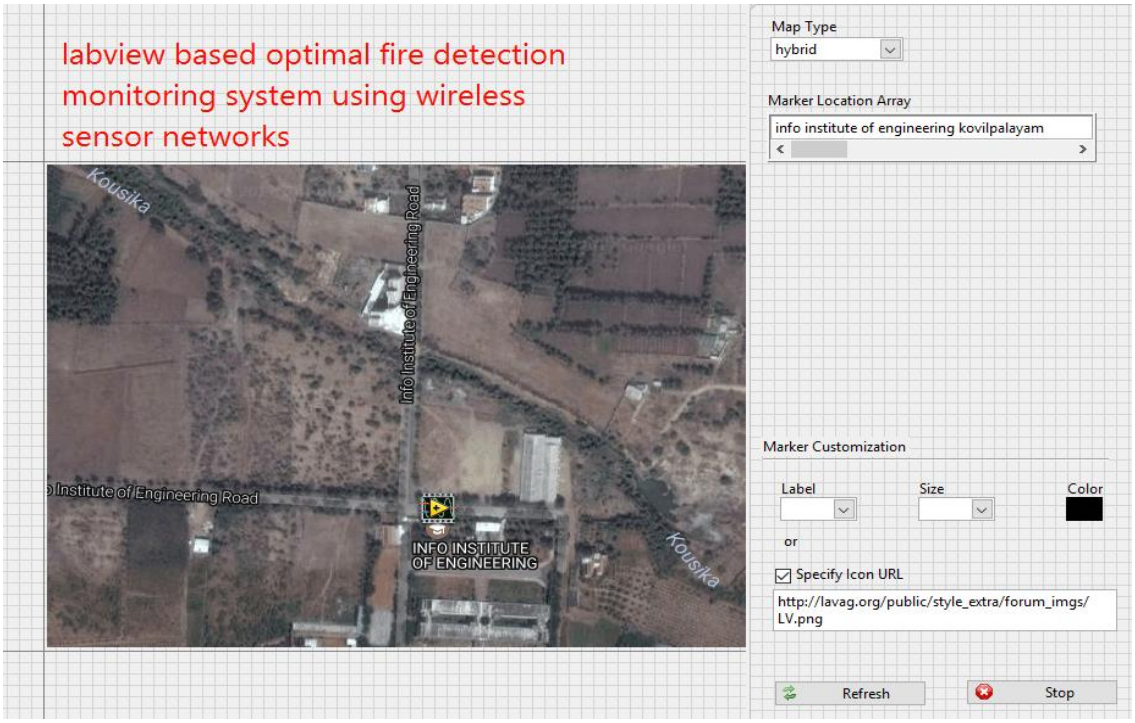

Figure.14. LabVIEW output for Location path finding

Figure 12 Shows that the Experimental Setup For hardware. The solar panel radiates the sun Energy and produces 21V. The 21v DC is given to Charge Controller Circuit. Charge Controller Circuit made up of DC-DC Converter. The voltage is Limited upto 12V and it to be stored in the battery. MyRIO and flame sensors are connected to the battery.

Figure 13 & 14 shows the LabVIEW model and output for GPS. When the Flame sensor are detected the fire with in the range which sends the Latitude location is given to wireless sensor nodes. The Particular location can be obtained by using LabVIEW software.

IV. CONCLUSION

Hardware implementation of forest fire detection using LabVIEW with wireless sensor networks based myRIO and flames sensor performance is validated using LabVIEW. This method is better optimization for comparing the other forest fire detection techniques. In hardware implementation solar panel 21V is given to controller circuit. Charge Controller circuit which provides the constant voltage 12V and stored into battery. Flame sensor and GPS based location monitoring is Connected through myRIO. The output from the flame sensor and gps is received by the myRIO. The labview program with led indication turns ON when fire occur in the forest. The labview monitoring section sends the fire alert message and also sends the location to nearest forest head office which is stored by myRIO port.

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ISSN(Online): 2320-9801
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Website: www.ijircce.com

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