

Autonomous Fire Fighting Robot

PratyashaSaha^{#1}, Towsif Azad^{*2}, Majimbo Newton^{#3}, Dr.V. Govindaraj^{#4}

[#] Department of Electronics and Communication Engineering, Sri Venkateswara College of Engineering & Technology, Chittoor, Andhra Pradesh, India.

¹bdsahapratyasha@gmail.com

²towsifazad07@gmail.com

³majimbonewton@gmail.com

⁴seelgovind@gmail.com

Abstract— We announce that Autonomous Fire Fighting Robot is a robot used for automatic detection and elimination of fire. As fire accidents are very common nowadays and in so many cases it is very risky and sometimes impossible for the fire fighter to extinguish fire effectively. We have designed this robot to overcome that problem. Fire can be extinguished using this without any direct human control and it is easy to maintain. We programmed the robot in such a way that it can detect fire, detect and avoid obstacle and put off the fire using water. We have used a very simple and affordable technology which is Arduino UNO.

Keywords— Robot, detection, fire fight, Arduino, obstacle.

I. INTRODUCTION

The danger of enabling this flame to develop all through the family unit or in a narrative room is crushing and clamorous. Each flame accident has its own outcomes, to dispose of these impacts we are proposing a creative thought of a practical, smaller and independent robot which can find, recognize and put out a flame consequently utilizing the ideas of essential mechanical technology and correspondence. It uses fire and fire sensor for identification and an Arduino board [20] –[23] to put out the flame alongside water siphon which is utilized to quench the distinguished flame. The robot moves while effectively examining for flame. The robot is made of Arduino Uno board to go about as the cerebrum of the robot, and fire recognizing sensor which is essentially infrared radiation beneficiary modules. An undercarriage is additionally required for the robot with DC engines, one water siphon and a can for putting away water.

II. RELATED WORK

Many researchers have done their work in this very field of fire fighting robot, most importantly on a development towards autonomous ones [1] – [10]. They have shown a path that is to be followed to improve the current development of the field.

Secluded structure dependent on nearness, vision and IR sensors [11] – [18] joined into a fire fighting model was planned in Canada. The blast confirmation waterproof shell of the unique fire fighting robot is created, which understands the exact recognition of the temperature and perilous objects of the discharge scene by the vision and temperature distinguishing proof of the firefighting robot. An astute multi sensor based self-ruling and semi-independent robot [19] was structured which salvages from flame mishaps in like manner everyday life.

III. PROPOSED SYSTEM

The proposed model (robot) is functioned to do integrated tasks aforementioned with the technology of Arduino UNO microcontroller board using ATmega328P.

OBSTACLE AVOIDANCE:

Obstacle detection robots are utilized to identify any impediments in its way, at that point it alters its course to maintain a strategic distance from crashes. Ultrasonic sensors are modest contrasting with different frameworks. By timing the beat it is conceivable to ascertain the range in inches/centimeters. The module gives a reverberation beat corresponding to separate.

FIRE DETECTION:

Fire identifiers react to the generation of one or a mix of ultra-violet or infrared ranges of electromagnetic radiation.

EXTINGUISHING FIRE:

A DC water pump is used for extinguishing fire. It pumps out water stored in a bottle. Any other suitable water pump can also be used. The robot is programmed to keep spraying water until it puts off the fire completely. This is done by a constant monitoring by the IR flame sensor.

IV. COMPONENTS REQUIRED

A. HARDWARE

- Arduino UNO
- Fire sensor or Flame sensor
- L293D motor Driver module
- Small Breadboard
- Robot chassis with motors and wheel (any type)
- A small can
- Connecting wires
- Ultrasonic Proximity Sensor (HC-SR04)

B. SOFTWARE

Arduino IDE Software: “The ARDUINO IDE is a cross platform application (for WINDOWS,MACOS, LINUX) that is written in the programming language JAVA”. It is used to write and upload programs to Arduino board.

V. CONSTRUCTION

As a breadboard was used for connection, two different lines were used as VCC and GND respectively for all the modules. The VCC and GND lines were connected to Arduino UNO 5v and GND line respectively. This is how all the modules were powered. The rest of the pin connections for the module were done as specified above. Finally the Arduino was powered using the USB port.

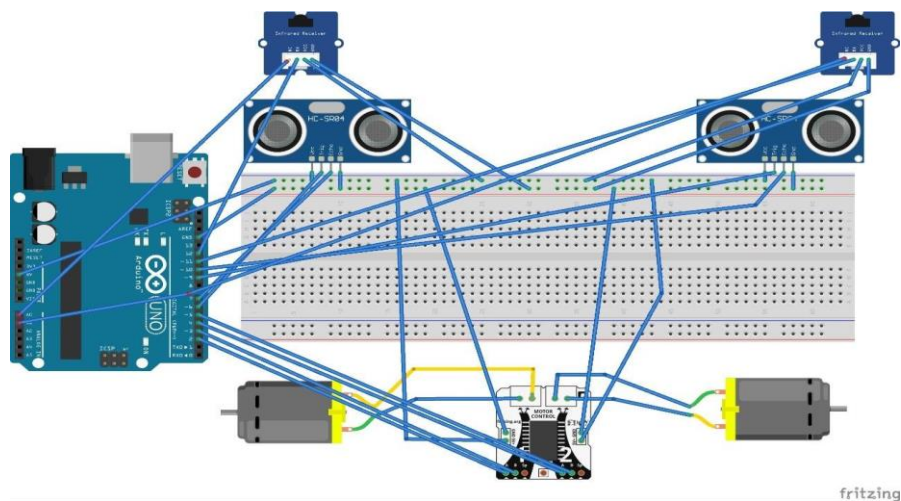


Fig. 1 The PIN connection of all the components with Arduino Board



Fig.2 Final image of the constructed robot

VI. CONCLUSIONS

The aim of this project is to “detect and extinguish fire automatically”. The core objectives which have been designated as fundamental to the project are: Extinguishing the fire on detection, detecting the fire in disaster prone area, providing audio and visual indications and reduces the effort of human labor and level of destruction.

Some extended actions that can be added are as follows: visual feedback, audio Command, refilling the water tank and adding both automatic and wireless control.

REFERENCES

- [1] J. Millman & Christos C. Halkias, Integrated Electronics, TMGH Edition, 2018.
- [2] Chemistry for Engineers by Prof. K.N.Jayaveera, Dr.G.V.Subba Reddy and Dr.C.
- [3] Ramachandriah, McGraw Hill Higher Education Hyd., 3rd edition, 2009.
- [4] Pellepl. "Wear-leveled SPI flash file system for embedded devices". GitHub. Retrieved, 2 April 2015.
- [5] "Autonomous Mobile Robot: Recognize & Response to Fire", NikMdHafizulHasmieMdSuhaimi, UTHM, Malaysia, 2017.
- [6] "Rolly Firefighter Robot", William Dubel, Hector Gongora, Kevin Bechtold, and Daisy Diaz, Florida International University, Miami, 2013.
- [7] "Fire Protection Robot", Viet Do, Ryan Norder, and Ryan Spratz, Moscow.
- [8] Microprocessor and Microcontroller, Second Edition, Department Of Computer Engineering, Faculty Electrical & Electronic Engineering, Universiti Tun Hussien Onn Malaysia (UTHM), Malaysia, 2008
- [9] <https://www.skyfilabs.com/project-ideas/autonomous-firefighting-robot>
- [10] <https://circuitdigest.com/microcontroller-projects/arduino-fire-fighting-robot-code>
- [11] <https://www.arduino.cc/>
- [12] https://www.researchgate.net/publication/325893695_Autonomous_Fire_Extinguisher_Robot
- [13] <https://www.elprocus.com/projects-on-fire-fighting-robotic-vehicle/>
- [14] S.Balakrishnan, "Peer-To-Peer Central Registry Based Internet of Everything (IoE) Protocol", CSI Communications magazine, Vol. 41, issue 4, July 2017, pp. 26-29.
- [15] S.Balakrishnan, J. Janet, R. Sachinkanithkar, D. Reshma, "Technological Innovations for Agricultural Developments Through Information Communications Technology (ICT)", CSI Communications magazine, Vol. 41, issue 6, September 2017, pp. 10-13.
- [16] S.Balakrishnan, S.Sheeba Rani, K.C.Ramya, "Design and Development of IoT Based Smart Aquaculture System in a Cloud Environment", International Journal of Oceans and Oceanography, ISSN 0973-2667, Volume 13, Number 1 (2019), pp. 121-127.
- [17] J.Janet, S.Balakrishnan, S.Sheeba Rani, "IoT Based Fishery Management System", International Journal of Oceans and Oceanography, ISSN 0973-2667, Volume 13, Number 1 (2019), pp. 147-152.
- [18] J.Janet, S.Balakrishnan, S.Sheeba Rani, "IoT based lake and reservoir management system", International Journal of Lakes and Rivers (IJLR).
- [19] S.Sheeba Rani, S.Balakrishnan, V.Kamatchi Sundari, K.C.Ramya, IoT Based Water Level Monitoring System for Lake in a Cloud Environment, International Journal of Lakes and Rivers (IJLR).
- [20] R. Ram Vishnu, V. Nobin Pal, C. Narasimma Moorthy, S. Balakrishnan, "Arduino Based Smart Alarm Mobile Application System", Jour of Adv Research in Dynamical & Control Systems. Vol. , 14-Special issue, 2018, pp. 1217-1223.
- [21] Ranjeethapriya K, Susila N, Granty Regina Elwin, Balakrishnan S, "Raspberry Pi Based Intrusion Detection System", International Journal of Pure and Applied Mathematics, Volume 119, No. 12, 2018, pp.1197-1205.
- [22] K. Dasaradharami Reddy, S. Mohanraju, Dr.A. Jebaraj Ratnakumar, Dr.S. Balakrishnan, "Querying and Searching of Friendship Selection in the Social IoT, Jour of Adv Research in Dynamical & Control Systems. Vol.10, 11-Special issue, 2018, pp. 910- 914.
- [23] V. Anandkumar, Kalaiarasan T R, S.Balakrishnan, "IoT Based Soil Analysis and Irrigation System", International Journal of Pure and Applied Mathematics, Volume 119, No. 12, 2018, pp.1127-1134.
- [24] S. Balakrishnan, J. Janet, K.N. Sivabalan, "Secure Data Sharing in a Cloud Environment by Using Biometric Leakage resilient Authenticated Key Exchange", Pak. J. Biotechnol. Vol. 15 (2) 293-297 (2018).
- [25] S. Balakrishnan, D.Deva, "Internal or External - Which Database Could Contribute More to Business Intelligence?", CSI Communications magazine, Vol. 42, issue 7, October 2018, pp. 24-25. ISSN: 0970-647X.
- [26] J. Janet, S. Balakrishnan and E. Murali, "Improved data transfer scheduling and optimization as a service in cloud," 2016 International Conference on Information Communication and Embedded Systems (ICICES), Chennai, 2016, pp. 1-3. doi: 10.1109/ICICES.2016.7518895.
- [27] Balakrishnan S., Janet J., Spandana S. "Extensibility of File Set Over Encoded Cloud Data Through Empowered Fine Grained Multi Keyword Search". In: Deiva Sundari P., Dash S., Das S., Panigrahi B. (eds) Proceedings of 2nd International Conference on Intelligent Computing and Applications. Advances in Intelligent Systems and Computing, vol 467. 2017. Springer, Singapore.
- [28] J. Janet, S. Balakrishnan and K. Somasekhara, "Fountain code based cloud storage mechanism for optimal file retrieval delay," 2016 International Conference on Information Communication and Embedded Systems (ICICES), Chennai, 2016, pp. 1-4. doi: 10.1109/ICICES.2016.7518901.
- [29] J. Janet, S. Balakrishnan and E. R. Prasad, "Optimizing data movement within cloud environment using efficient compression techniques," 2016 International Conference on Information Communication and Embedded Systems (ICICES), Chennai, 2016, pp. 1-5. doi: 10.1109/ICICES.2016.7518896.
- [30] M. Balasubramanian, M. Balasubramanian, S. Balakrishnan, "Data Movement Optimization In A Cloud Environment Using Capacity Optimization Technique", Jour of Adv Research in Dynamical & Control Systems. Vol. 10, 11-Special Issue, 2018, pp. 740- 743.
- [31] Sruthi Anand, N.Susila, S.Balakrishnan, Challenges and Issues in Ensuring Safe Cloud Based Password Management to Enhance Security", International Journal of Pure and Applied Mathematics, Volume 119, No. 12, 2018, pp.1207-1215.
- [32] Dipon Kumar Ghosh , Prithwika Banik , Dr. S. Balakrishnan (2018), "Review-Guppy: A Decision-Making Engine for Ecommerce Products Based on Sentiments of Consumer Reviews", International Journal of Pure and Applied Mathematics, Volume 119, No. 12, 2018, pp.1135-1141.
- [33] K. Aravind, J. Granty Regina Elwin, T. Sujatha and S. Balakrishnan, (2018), "A Novel And Efficient Mobile Cloud Service For Searching Encrypted Data", ARPN Journal of Engineering and Applied Sciences, Vol.13, No.16, pp. 4683- 4686, 2018.