International Journal for Innovative Engineering and Management Research

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IJIEMR Transactions, online available on 18th October 2024. Link

https://ijiemr.org/downloads.php?vol=Volume-13 &issue= Issue 10

DOI:10.48047/IJIEMR/V13/ ISSUE 10/31

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Volume 13, ISSUE 10, Pages: 200- 204

Paper Authors

MS.DURGA BHAVANI, K. PRANATI, S. KARISHMA

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ARTIFICIAL INTELLIGENCE BASED HUMAN DETECTION ROBOT FOR EARTHQUAKE RESCUE OPERATION

MS.DURGA BHAVANI, K. PRANATI, S. KARISHMA

[1]Assistant Professor, Department Of Electronics And Communication Engineering, Malla Reddy Engineering College For Women, Hyderabad.

[2,3,4]Ug Scholar, Department Of Electronics And Communication Engineering, Malla Reddy Engineering College For Women, Hyderabad

ABSTRACT

Natural calamities do occur and they are unstoppable. But humans are becoming increasingly aware in the concept of intelligent rescue operations in such calamities so that precious life and material can be saved though calamities cannot be stopped. Still there are lots of disasters that occur all of a sudden and Earthquake is one such thing. Earthquakes produce a devastating effect and they see no difference between human and material. Hence a lot of times humans are buried among the debris and it become impossible to detect them. A timely rescue can only save the people who are buried and wounded. Detection by rescue workers becomes time consuming and due to the vast area that gets affected it becomes more difficult. So the project proposes an autonomous robotic vehicle that moves in the earthquake prone area and helps in identifying the alive people and rescue operations. In this iot based live human detecting robot for earthquake rescue operation project, a new method for detecting surviving humans in destructed environments using simulated autonomous robot is proposed. The first level is a PIR sensor used with a temperature sensor that is used as the primary sensor in order to detect the existence of living humans in a scene. Wireless communication help to require the humans.

I.INTRODUCTION

A unique Passive Infrared sensor is used in the project which emits infrared rays to detect humans. As live human body emits thermal radiation it is received and manipulated by the PIR sensor to detect humans. Once the people are located it immediately gives audio alert visual alerts to the authorities so that help can reach the live person so fast. This PIR sensor is placed on a moving all direction robot that can man ever in the earthquake prone areas. The robot is driven on a geared dc motor for increased torque and low speed and stepper motor for increased turning accuracy hence the precise control of position is monitored. The robot consists of a three wheel geared drive with DC motors attached to perform forward and reverse movement. Earthquakes produce a devastating effect and they see no difference between human and material lot of times humans are buried among the debris and it become impossible to detect them Detection by rescue workers becomes easy. These people are visible to very dangerous situations caused by the destructed location they work in like distorted buildings, landslides, crater, etc. So, there is a coincidental for the rescuer to become a victim who needs to be rescues. It means the rescue operation imposes significant risk on rescue personnel themselves. Alive human detector uses PIR sensor to detect alive humans. As live human body emits thermal radiation it is received and manipulated by the PIR sensor

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to detect humans. PIR sensors are passive infrared sensors. They detect change in the heat and this can be used to detect movement of people. It has digital output and can be directly given to the digital pins and no ADC is needed. It operates at 5V DC. The PIR (Passive Infra-Red) Sensor is a hydroelectric device that detects motion by measuring changes in the infrared (heat) levels emitted by surrounding objects.

II.EXISTING SYSTEM

Earthquakes produce a devastating effect and they see no difference between human and material lot of times humans are buried among the debris and it become impossible to detect them Detection by rescue workers becomes time consuming and due to the vast area that gets affected it becomes more difficult.

III.PROPOSED SYSTEM

The project proposes an autonomous robotic vehicle that moves in the earthquake prone area and helps in identifying the live people and rescue operations. Hence precious life can be saved by timely detection in natural calamities even without the help of large number of rescue operation.

IV.LITERATURE SURVEY

Chou Wusheng, Wang Tianmiao, You Song, Sensorbased autonomous Control for telerobotic system, Proceedings of the 4th World Congress On ntelligent Control and Automation,3(2002),2430-2434.

Shape memory alloy (SMA) actuator is a potential advanced component for servosystems of aerospace vehicles and aircraft. This paper presents a joint with two degrees of freedom (DOF) and a mobility range close to ±60 when driven by SMA triple wires. The fuzzy proportional-integral-derivative (PID)-controlled actuator drive was designed using antagonistic SMA triple wires, and the resistance feedback signal made a closed loop. Experiments showed that, with the driving responding frequency increasing, the overstress became harder to be avoided at the position under the maximum friction force. Furthermore, the hysteresis gap between the heating and cooling paths of the strain-to-resistance curve expanded under this condition. A fuzzy logic control was considered as a solution, and the curves of the wires were then modeled by fitting polynomials so that the measured resistance was used directly to determine the control signal. Accurate control was demonstrated through the step response, and the experimental results showed that under the fuzzy PID-control program, the mean absolute error (MAE) of the rotation angle was about 3.147. In addition, the investigation of the external interference to the system proved the controllable maximum output. Shape memory alloy (SMA) is a metal that exhibits a crystal transition up to or below a critical temperature that causes it alternate between the austenite phase and the martensite phase. In the martensite phase, SMA is soft and has inelastic straining1 ; however, in the austenite phase, the structure can contract back to its original shape, with an elastic modulus of roughly 100 GPa. Moreover, the maximum recoverable strain is more than 5% of the original length, even under some obstructions. With the growing demands for miniature

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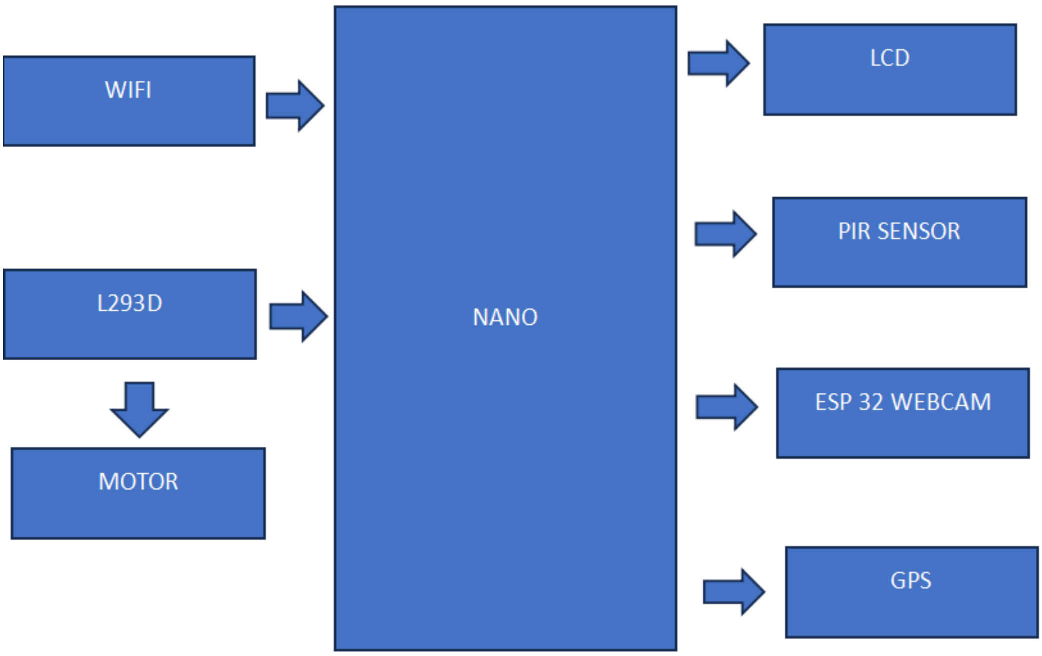
applications, SMA actuators have been used in miniature mechanical devices due to their simple designs and high power-to-weight ratios. In aerospace systems, SMA actuators can be developed as important components for future space vehicles and aircraft. For space vehicles, SMA actuators can be applied in advanced servo-systems, such as thrust vector adjusting systems for satellite attitude control and manipulators of manned or unmanned space vehicles. Recently, a prototype SMA actuated locking device was developed for satellites.2 In another hand, SMA actuators also show their potential to be applied in aircraft, such as servo-systems of smart aircraft to change aerodynamic shapes3 and controlling systems of rudders of missiles. The Boeing Company applied for a patent which focused on several aircraft systems with SMA actuators in 2009, and the new actuator was used to couple a deployable device to the airfoil in different methods.4 Another effort of SMA actuators has been to develop smart rotors for helicopters to minimize the problems of noise and vibration.5 Following the above applications, SMA actuators show their advantage for minimized structures in limited space. For better compactness, employment of self-sensing is required to reduce the amount of additional sensors. This would also increase the robustness and fail-safety of the system. As a smart material, the electrical resistance of an SMA undergoes an observable change with a metallographic transformation, which is much more noticeable than the resistance change due to the metal's shape. Many studies have described the relationship between the strain and the resistance of an SMA, but the associated mathematical modeling is completely different when the components of the SMA change.6 Moreover, in addition to temperature, stress can also affect the on-time electric resistance value of an SMA.7 Many groups6,8–13 have developed actuators that use resistance as a sensor, and most of these studies focused on wirespring actuators. Since the driving unit is inactive, achieving sufficient simultaneous stiffness and compactness with a spring is difficult. Compared with conventional SMA devices that require bias force components, antagonistic SMA multi-wire actuators with self-sensing capabilities show fully reversible responses,7 and also have a higher response frequency, which shows their potential for wide applications. Based on antagonistic SMA multi-wire actuators, some instruments have been designed for applications,14–17 although the nonlinear stiffness of the SMA wires during phase transformation offers a complex inner stress between antagonistic SMA wires, especially when the structure is complex. As shown in Fig. 1, the joint uses three SMA wires to achieve two degrees of freedom (DOF), which show an indeterminate amount of inner stress under different postures. The inner stress varies with the phase transformation of SMA wires and the friction force between the discs and the ball link of the joint. The nonlinear inner stress requires the construction of self-sensing models with a variable coefficient, which is quite difficult to achieve. Furthermore, a way of knowing all inner-stress characteristics is needed. However, in real-world applications, measurements of inner stress are unachievable, due to the demand for compact devices. Nevertheless, a ‘‘black box'' control method can accomplish the task. As with many other smart materials, the hysteresis properties of SMA actuators show significant impact on the accuracy and stability in a regulation. To overcome the hysteresis properties of SMA actuators, researchers often choose a combination of a feedforward controller and a feedback loop. Specifically, the Preisach model,12,18 neural network,8 and Duhem differential19 have been used to model hysteresis properties. Another possible solution is an SMA wire resistance controller,20 in which the feedback signal is the simple linearized law between the wire strain and resistance values, assuming a sufficient load. A nonlinear proportional-integral-derivative (PID) controller is an option to improve the stability of the system and simultaneously reduce energy consumption.21–23 Most of the aforementioned platforms perform under linear stress with less interference. Further research on the use of an antagonistic pair of SMA wires in an actuator with nonlinear stress has shown improved accuracy by limiting inner stress to a narrow range.24 Yet, this is harder to achieve within more complicated structures, as shown in Fig. 1. Fuzzy logic control is another way to construct the controller with resistance feedback under nonlinear inner stress,25,26 which is particularly well suited for uncertain or nonlinear conditions. In this paper, we present our research on fuzzy PID-controlled architectures for an actuator with antagonistic SMA multi-wires, a newly designed two-DOF joint, and a resistance feedback signal that makes a closed loop. Consequently, a new approach for precision is proposed, which is sensorless SMA servo control: the hysteresis paths of both wires are modeled using polynomial functions and a fuzzy PID controller is used to reduce the overstress and improve the responding speed. In Section 2, the experimental setup of the testing platforms is described. After the basic kinematic model is described in Section 3, the internal force disturbing of the strain-to-resistance (S–R) curve is analyzed, and the modeling of the SMA actuator and the control strategy of the actuator with three SMA wires are presented. The control scheme based on the fuzzy PID controller and the self-feedback model is presented in Section 4, and the experimental results are discussed. In Section 5, the conclusions drawn from this study are presented.

Block diagram



V.CONCLUSION

Hence many life's can be saved by using this autonomous vehicle during an earthquake disaster in a short duration which becomes time consuming and unaffected if done manually. This vehicle can be improved by using high range sensors and high capacity motors. Some more sensors like mobile phone detector, metal detector etc. can be implemented to make this vehicle more effective. This System is an effective and a safe system to ensure that there are no humans left behind in a rescue operation. The System is safe even for the user because of the use of robotics and no manual work The system uses Bluetooth and this makes the system both accurate and reliable. Battery backup for camera is weak which can be overcome by using a solar panel. The initial cost may be high if very high range sensors are being used in commercial usage. Net work problem time we use in iot based live human detection.

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