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Multitasking Humanoid for Surveillance & Monitoring

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ABSTRACT

In Contemporary world, the state of art surveillance and monitoring system is the need of the hour. All the technical advancements and the research should be streamlined to focus on the robotics domain. The proposed autoboot is multifaceted and can be instrumental in sensing various external stimuli such as optical input, sound input, visual inputs and the external stimuli in the form of temperature, pressure, pH, strain, humidity, etc using artificial skin where paper-based substrate may be used. All these features will make the bot compatibility to replace a human in space. This will enhance the safety of human lives in space. This autoboot will have a range of applications in the fields of disaster management, bio-medical, robotics and many others and can be further extended to space applications in the future. This automated-robot will have real-time sensing capabilities and an integrated sensor network will enhance it.

Keywords: Humanoid, Artificial skin, space, Sensory Organs, Electronic and Computer Controller

INTRODUCTION

The ongoing research which discloses the fact that life may exist in some other part of universe, some galaxies even inhabited by life. These theories have been proved by many scientists and the recent research by NASA about life being possible on Mars simply boosts these types of research further. To carry such kind of research humans are not suitable for various reasons such as need for food, adapting to different environment condition in terms of climate, gravitational force, etc. The need for robots or humanoid arises to proceed with the research. Humanoid as the name suggests it means 'Human like'. Hence these can be trained to carry out various operations such as temperature sensing, measuring pressure, humidity, strain, etc. Here a humanoid will be designed along with its prerequisites for surveillance and monitoring for various applications such as Space applications, bio-medical, disaster management. Amongst these applications, Spaceapplication will be a major advancement, as it will replace a human in space to do the task with similar efficiency and thus ensuring his safety, the humanoid will have long lives and thus it will be able to handle any mission extension programs.

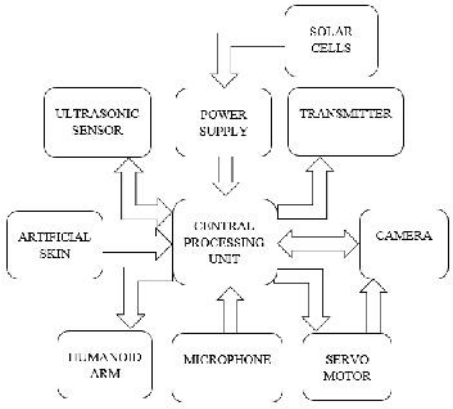

Figure 1: Block Diagram of Humanoid system

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As shown the figure 1 depicts basic block diagram of a humanoid. As seen the main controlling unit is the Central Processing Unit which controls all input and outputs. The inputs are taken in form of images from camera, voice from microphone, sensing temperature, pressure, and strain with the help of artificial skin. The functions determined by users will be performed by humanoid arm. Figure 2 shows the block diagram of earth station which has a memory unit to store data and display, which displays the results. These blocks are further explained in next section.

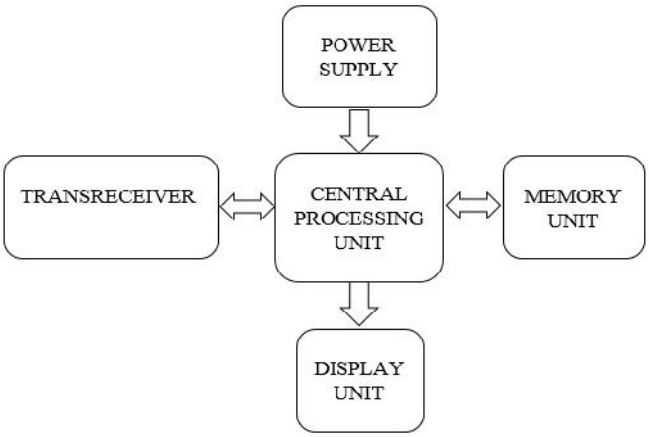

Figure 2: Block Diagram of Earth Station

APPROACH

The initial step is to buy all the required components and assemble them. The artificial skin needs to be made from different materials according to sensitivity, cost, etc.

1. ULTRASONIC SENSOR

The ultrasonic sensor is a device which is used to measure distance of an object/obstacle by using sound waves. It is used for obstacle detection in this case. Ultrasonic sensor transmits the ultrasonic waves from its sensor head and again receives the ultrasonic waves reflected from an object. They are compact, lightweight, High sensitivity, high pressure, High reliability and consumes power of 20 mA.

2. POWER SUPPLY

The power supply is needed to run the entire system hence this should be most efficient. This unit consists of a high-quality battery which is light weight, fast recharging capability and has long batterylife. The power supply unit can be charged by using solar cells. This would imply that no extra supply will be required for charging.

3. CAMERA

A high resolution, night vision camera will be suitable, because the image needs to be transferred over earth station and may be received over very long distance. The camera is operated by the main unit that is central processing unit (CPU). The camera will be mounted on servo-motor.

4. SERVO-MOTOR

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It's an independent device which rotates part of device with high precision and efficiency. Servo-motor serves two purposes in this project:

• For getting a 180-degree view for camera.

• For designing of humanoid arm.

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5.HUMANOID ARM

The humanoid arm consists of various servo-motors placed to work as a human arm.

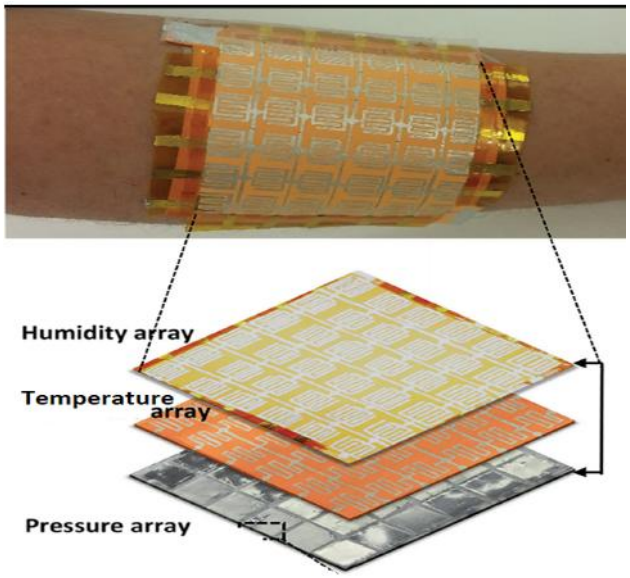
6.MICROPHONE

It is used to capture audio signal present around the humanoid and send it to the CPU to process it further and obtain information from it.

7. ARTIFICIAL SKIN

It is a type of sensor specifically manufactured for working on similar grounds as that of human skin. It can sense temperature, pressure and strain. It can also detect touch of external stimuli and can calculate pH value of the substance present on the skin. The skin can be made by using aluminium foil enclosed around a sponge for pressure sensing.

ROBONAUT DESIGNED BY NASA



ARTIFICIAL SKIN

8.TRANSRECEIVER SYSTEM

The humanoid can be used for various applications. Depending upon the applications, transreceiver module can be replaced. The transreceiver system consist of various modules such as encoder, decoder, modulator, demodulator. Here the communication between humanoid and earth station is done through satellite. The satellite exchange information between humanoid and earth station takes place.

9. CENTRAL PROCESSING UNIT

This is the core block present in both humanoid as well as earth station. The CPU has main function of processing signals such as audio, video and image. It also provides following functions such as object detection, analog signal to digital signal conversion, providing proper power supply to all sensors and transmitting and receiving the signals.

10. MEMORY UNIT

This unit stores the surveillance data sent by humanoid. This data consists of video, audio, temperature readings, humidity. It will use storage components and store all data which are sent to the user and in case of any error in the data sent or due to certain crash down, a backup will be maintained.

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WORKING

The object is first detected by ultrasonic sensors and is subsequently viewed by the camera. The camera can pan up to 180 with the help of the servo motor. The microphone will enhance the detection by capturing the surrounding sounds. The humanoid arm is the base on which the artificial skin is mounted. The arm may be used to lift or pick the objects whereas the artificial skin will detect the environmental stimulus such as temperature, pressure, humidity, pH, etc. When external stimuli are applied to the artificial skin, it will have the capability to detect multiple stimuli simultaneously. This feature can be enhanced depending on the priority of the external stimulus. For example, when a hot wet finger is applying pressure on the artificial skin, it should have the capability to detect the temperature, pressure and humidity in the external stimulus applied depending on the priority list that what should be detected first. If temperature has the highest priority, it will be detected first before detecting the pressure and the humidity and vice versa. The power supply is renewable with a solar panel integrated in the design.

CONCLUSION

According to the approach followed in this paper, a Humanoid can easily replace humans for various applications in biomedical, astronomical domain. The humanoids can be used precisely for video, audio and image processing over long distances. In general this is a simple and most reliable way of implementing autobots by using components mentioned above.

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