DESIGN AND FABRICATION OF MULTIPURPOSE SURVEILLANCE BOT

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ABSTRACT

A robot can be defined as a programmable, self-controlled device consisting of electronic, electrical, or mechanical units. More generally, it is a machine that functions in place of a living agent. Robots are especially desirable for certain work functions because, unlike humans, they never get tired. In this context the proposed idea is to develop a robot which is feasible and suitable for movement over rough and rugged terrains. Characteristics that make robots different from regular machinery are that robots usually function by themselves, are sensitive to their environment, adapt to variations in the environment or to errors in prior performance, are task oriented and often have the ability to try different methods to accomplish a task. This robot is invented and it is made like an insect with six legs so that in battlefields. It can't get tracked down very easily, and it can easily go to the enemy location. Any soldier can handle this robot from a far distance and this robot has a camera on board so the soldier can have a live feed and it can run the robot as per requirement, it can be also used to sneak in the enemy base. So this is one try to make something which will work to collect the information and as well as it is a weapon which can be used without harming humanlives. The robot's design consists of a rigid body with six compliant

Legs; each possessing only one independently actuated revolute degree of freedom. The attachment points of the legs as well as the joint orientations are all fixed relative to the body.

The use of spoke wheels is of course an old idea. Legs have an advantage over wheels in terms of rough terrain. But there is a drawback with the articulated legs usually found on walking robots; they require complex, specialized instructions for each moving part.

Keywords*: Rugged terrain, degree of freedom.*

1.1. Introduction

Despite the images of agile humanoid or animal-like robots long held in the public imagination, legged robots capable of dynamic locomotion have only recently been developed. One of the first such dynamical machines is RHex; a hexapod with a single, unrestricted rotary actuator per leg. While mechanically simple, this design has achieved a variety of interesting locomotion tasks, including walking, running, leaping and flipping, climbing stairs, and even running upright on its rear legs. A number of robots have been built based on the RHex concept.

In this report, we describe the development and implementation of the newest descendant in the line of RHex robots. Moreover, RHex boasts a number of substantial improvements in the capabilities of its mechanical and electrical systems which make it capable of both highly dynamic maneuvers and sensor rich autonomous behaviors.

2.1. Literature Review

Silva et al., has presents the kinematic study of robotic biped locomotion systems. The main purpose is to determine the kinematic characteristics and the system performance during walking. For that objective, the prescribed motion

of the biped is completely characterized in terms of five locomotion variables: step length, hip height, maximum hip ripple, and maximum foot clearance and link lengths. In this work, we propose three methods to quantitatively measure the performance of the walking robot loco mobility measure, perturbation analysis and low-pass frequency response. These performance measures are discussed and compared in determining the robustness and effectiveness of resulting locomotion.[1]

Ahmadi et al., describes the experimental implementation of an energy efficient controlled passive dynamic running strategy on a planar one legged running robot with hip and leg compliance. This is the highest efficiency among all actively controlled legged robots. [2]

3.1. Methodology

There are some spying robots which are controlled by remotes, spying robot also have a camera and it also transmits video material or information to the mediation group or spying group. The size of these types of robots is usually suitably small so can travel more efficiently. These type of robots which should be handle in a secret manner it have camera which will also controlled by remote, batteries, an antenna, RF module (Radio frequency modules) are also used in this robot for receiving and transmitting the signals from remote to agent robot, so the user can control the robots speed, turning of robot basically whole control over the robot. To have good control over speed and turning we have used brushed DC motors. These robots have been given legs instead of tires so that they can move around and over the obstacles freely without causing any trouble to the viewer when transmitting the live feed. The legs have been designed in half circular shape so that they can take the stress of the body when moving. The six individual legs move at different rotations so that they have sis degree of freedom movement.

3.2. Working Principle

The frame is light and stiff to optimize locomotive performance, and sufficiently strong to protect hardware and maintain structural integrity even when subjected to severe impacts.

The robot has an aluminium body of 25*39*6m .the legs are of 20kg/cm torque and each motor gives the 100RPM. The motors are connected to motor drivers which are used to command the motor when to rotate the legs. The whole robot is operated by the means of Arduino mega .put the Arduino Mega, NodeMCU and DTH 22 in the chassis and gives the wiring connection properly to the Arduino . The male jumper and female jumpers are used for connection of hardware components and 3 LiPo batteries are placed inside the body of robot and stick them from the bottom side with double sided adhesivetape.

The main controller in this electronic system is Arduino mega. To be able to control six motors .Each motor Driver can be loaded bythe current up to 43A that gives a large margin of power even for the mobile robot moving over rough terrain. The Electronic system is equipped with two power sources. One for supplying the DC motor (LiPo battery 11.V, 1300 mAh) and the other to supply Arduino, Bluetooth module and sensors (LiPo battery 11.1V highermAh).The DC motors converts direct electrical energy into mechanical energy. The motor speed can be controlled over a good range, by providing variable supply voltage or by changing the strength of supply voltage or by changing the strength of the current in its field winding.

The robot has six legs, three legs moves at a time of sync. The left half arc structure rotates by driving motor 3 until 3 half arc structures are fit together. We would need to use encodes for this we plan onusingan Arduino mega

because it has six hardware interrupts. A PID control system would keep the motor position correct. Connect the control board to your computer with a USB Cable. After connected to the board the green LED labelled as PWR on the control board will be on LED beneath it will flash a few times on the Arduino board the red LEDS labelled as LED1 toLED5.

If the robot is not moving, turn the power switch off. Connect the motor board to the computer with a USB cable. Load the file, Example, Robot motor core sketch in the IDE, and select the Arduino from the boards menu. The robot is controlled by using an analogue remote controller. The movement principle is set to that of insect in the robot.

List of Components

Wireless Audio Video Camera

This is a simple to use wireless video camera. The camera can be used to transmit audio and video wirelessly through a 2.4 Ghz Wireless Network. The transmitter comes in a small package and can be powered through a 9V battery. The receiver works of 12V and comes with a tuning knob to adjust the receiver channel frequency.

The camera can transmit videos unto a distance of 100 m in line of sight. The receiver can directly be connected to TVs to view the video or to a computer/laptop with appropriate Video Capture Devices. This kit includes the transmitter, receiver, power supply adapters for both the transmitter and the receiver, 9V battery clip for the transmitter and all required cable

3.2.11. Bush

A bush is a mechanical fixing between two, possibly moving, parts, or a strengthened fixing point where one mechanical assembly is attached to another. In a car or other vehicle's suspension, bushes are used to connect the various moving arms and pivot points to the chassis and other parts of the suspension.

For fitting the legs onto the shaft, 6 different bushes of length 6 mm were made. The bush also has an inner hole of 0.8 cm.

Each bush has two holes made of 2 mm in diameter to be tightened by the help of screws.

4.1.1. Turning Operation

Turning is a form of machining, a material removal process, which is used to create rotational parts by cutting away unwanted material. The turning process requires a turning machine or lathe, workpiece, fixture, and cutting tool. The process was used to create bushes which we use in the fitting of the legs. The workpiece is a piece of pre-shaped material that is secured to the fixture, which itself is attached to the turning machine, and allowed to rotate at high speeds. The cutter is typically a single-point cutting tool that is also secured in the machine. The cutting tool feeds into the rotating workpiece and cuts away material in the form of small chips to create the desired shape.

4.1.2. Hand Drilling

Drilling machine is one of the simplest, moderate and accurate machine tool used in production shop and tool room. It consists of a spindle which imparts rotary motion to the drilling tool, a mechanism for feeding the tool into the work, a table on which the work rests and a frame. It is considered as a single purpose machine tool since its chief function is to make holes. However, it can and does perform operations other than drilling also. Drilling is a process of making hole or enlarging a hole in an object by forcing a

rotating tool called Drill. The same operation can be accomplished in some other machine by holding the drill stationary and rotating the work. Using this process we have made holes on the body the robot. So, that the top panel can be fixed with the help of nuts and bolts. We have drilled 6 holes on the upper side of the body which are 6mm above from the base. The same holes are drilled on the top panel.

4.1.3. Shearing Process

Cutting processes are those in which a piece of sheet metal is separated by applying a great enough force to cause the material to fail. The most common cutting processes are performed by applying a shearing force, and are therefore sometimes referred to as shearing processes. When a great enough shearing force is applied, the shear stress in the material will exceed the ultimate shear strength and the material will fail and separate at the cut location. This shearing force is applied by two tools, one above and one below the sheet. Whether these tools are a punch and die or upper and lower blades, the tool above the sheet delivers a quick downward blow to the sheet metal that rests over the lower tool. A small clearance is present between the edges of the upper and lower tools, which facilitates the fracture of the material. The size of this clearance is typically 2-10%of the material thickness and depends upon several factors, such as the specific shearing process, material, and sheet thickness.

The effects of shearing on the material change as the cut progresses and are visible on the edge of the sheared material. When the punch or blade impacts the sheet, the clearance between the tools allows the sheet to plastically deform and "rollover" the edge. As the tool penetrates the sheet further, the shearing results in a vertical burnished zone of material. Finally, the shear stress is too great and the material fractures at an angle with a small burr formed at the edge. The height of each of these portions of the cut depends on several factors, including the sharpness of the tools and the clearance between the tools.

With the help of the cutting tool we able to shape and cut the Aluminium to required shape and size. The sheet was cut into the dimensions of 31 cm in width and 44 cm of length. With this the extra parts were cut and then folded up with the height of 6 cm is made.

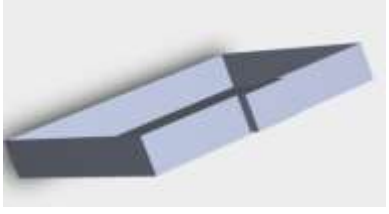
4.1.4. AutoCAD

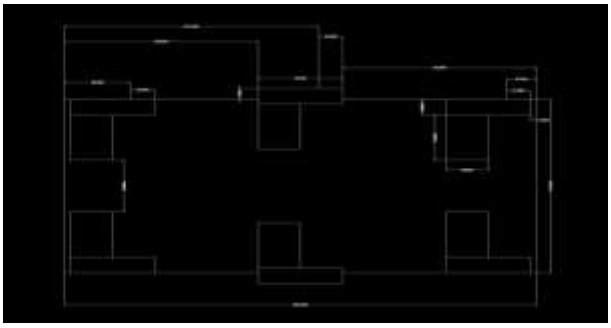
AutoCAD is referred to as a commercial computer-aided design (CAD) and drafting software tool. It is widely utilized across an array of industries by architects, engineers, project managers and several other professionals.

AutoCAD is known term when it comes to 3D and 2D CAD design. AutoCAD software is a tool that facilitates the process of designing and communicating the end results with others.

4.1.5. Solid Edge

Solid Edge is easy to learn and use, from interface to the individual tools that we can learn a wide range of skills including complex surfacing, solid modelling, assemblies, and engineering drawings. This software is used to create the 3D model.





3D view of chassis

5.1. Conclusion

An overview of the design and development of the robot have been presented in this paper. The Mechanical design and controlling strategy of robot will improve its dynamic capabilities when compared to previous platforms. Together these characteristics make the robot a high-level intelligence of a robust legged platform in rough terrain. As an additional feature the location and video are recorded and sent to the controller. By analyzing the robot's efficiency, run-time duration, and dynamic capabilities, we can gauge the effectiveness of our design choices.

6.2. Future Scope

The Multipurpose surveillance bot is a different and unique form of a robot. The use of the robot in many different ways is possible from daily basis to military purposes nearly anything is possible.

6.3. Future Improvements

The Multipurpose surveillance bot has advantages and disadvantages. The problem if for with the battery life it can give up to 3 hrs of run time on a single charge. Due to this it may lose the wireless feed and shut down. We can try to improve the model with further research and programming.

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