iLeap Abstract

Idea-
We plan to make a bot that can move and jump. It will be user-controlled. We will make it automated if we get time.
We have also planned to use a gyroscope and a camera to film while jumping/moving and stream the data to a laptop (further additions if we have time).

Reference- https://www.youtube.com/watch?v=6b4ZZQkcNEo

Motivation- The design of the bot is such that it can be used for surveillance and can reach hazardous places . It can also jump off different terrains which makes it fascinating and different from mainstream all-terrain bots.

How we plan to implement it-
We will most probably use Atmega16 and RF Module to control the movements of the bot.
For making the bot jump, we'll use a pneumatic piston actuator. The filling up of compressed air will be controlled by an electrical solenoid valve. We'll mostly use Servos to control the pre-jump standing up on two wheels of the bot.

Selection of the pneumatic piston actuator-
Mostly, we'll be using a pneumatic cylinder that uses compressed air. The selection will based on the amount of pressure provided by the cylinder (and the cost).
We'll first need to calculate the static and dynamic CG of the bot. Then, we'll calculate the maximum height to which our bot can jump (mostly constrained by the weight and aerodynamic drag).
Based on all these factors, we'll figure out if one piston will be enough to do the job, or if we'll need two pistons.

Reference- http://cdn.norgren.com/pdf/actuator_guide.pdf

Selection of wheels of the bot-
We'll need elastic wheels which can nullify the impact of the landing of the bot.

Selection of chassis-
We'll need a strong and lightweight chassis which can hold the battery as well as the piston. (Mostly aluminium and polycarbonate)

Battery- 12 V DC LiPo

Cost-
Pneumatic Piston actuator with cylinder- 3k
Battery- 2k (We could use a Lead Acid battery, but that would make our heavier, making it difficult for the piston to propel the bot into the air)
Chassis, Wheels, Servos- at least 3k-4k
Total cost - Approx. 9k

Timeline-

Week 1- Learn how to program the microcontroller according to our needs to use it to control the motor driver simultaneously dealing with the aspects of pneumatic piston actuator or to find a better way to make it jump.

Week 2- Learn how to control a pneumatic piston actuator using an electrical solenoid valve, and implement it.

Week 3- Make chassis, wheels, and select the motors. (We'll have to modify the wheels to make them more robust) and install servos in it.

Week 4- Assemble the bot, put everything in it. Gather some more information to save the bot from jerks, landing impulse and implement it to make the best out of it. Program the microcontroller simultaneously.

Week 5- Test the bot, make corrections.

Week 6- Buffer Week, make additions to bot if possible.

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