Individual Lab Report 2

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Team B : **Space Jockey**
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ILR02
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1. Introduction

This report gives a brief description of our team progress along with my individual contribution so far towards the MRSD project. After our last progress review on October 10, 2013, I was working on trade study about servos and began designing the power distribution board conceptually.

In the main project my role is to develop the electrical board including the power distribution board, main controller board and also circuit board for each subsystem.

2. Individual Progress

2.1. Trade Study about Servo Motors

In determining what kind of servo motors we need, I did some trade studies about several choices of servos. There are two types of motor servos: analog and digital servo. Table 1 shows the comparison between analog and digital servo.

Table 1. Table Comparison between Analog and Digital Servo

No	Analog Servo	Digital Servo
1	On/off input signal frequency is standardized to 50 cycles a second	Microprocessor inside the servo analyzes the receiver signals and processes these into very high frequency voltage pulses to the servo, which 300 cycles a second
2	Larger dead band, but slower response, and less torque.	Smaller dead band, faster response, quicker and smoother acceleration, and better holding power. Higher torque.
3	If we try to turn the servo wheel off center, it needs some time to response.	It feels like the servo wheel and shaft are glued to the case – it responds that fast and holds that well
4	Not consuming power as much as digital servos	It consumes power much because of the high frequency signal.

Based on the trade studies, we have chosen a digital servo for building the first prototype: HS-5496MH from Hitec, Inc. It has maximum torque of 100 oz-in and maximum speed of 0.15sec/ 60 degrees.

2.2. Create Conceptual Design for the Power Distribution Board

I have done the conceptual design of the power distribution board for Task 10 also. We chose LiPo battery cells with 5000mAh and 7.4V as our power source and Arduino Due as our main controller. I decided whether we need overvoltage protection circuit and voltage monitoring circuit. Nate also helped me in calculating the power needed by servos. The details can be seen from task 10 assignment that I have submitted.

2.3. Get the Sticky "Gecko" Material

Together with Songjie, I met Metin Sitti, a professor of nano robotics at CMU who built Waalbot and Tankbot that can climb the wall using sticky materials on the robot's foots and tires. He had advised us to get Vytaflex 10 to make the "gecko" materials. We have ordered that, which is shown on figure 1. The next step is creating that "gecko" material and implementing that on one foot.

e. Things I have learned

This week I learned about digital servo and analog servo concept, and also about sticky materials that is used to create Waalbot and Tankbot of Metin Sitti.

3. Challenges / issues

3.1. Deciding the Servo for The Robot

Our team faced the challenge of getting the correct servo for our first prototype. We have to choose between analog and digital servos. After deciding that we will use digital servo, we have to choose the correct type of servo.

3.2. Finding the Sticky Materials

Before meeting Metin, our team have no clue on what kind of materials should be used to create sticky stuff. After doing some searching and talking to robotic professor such as Dimitrios Apostolopoulos, we found that Metin has created sticky robots that can climb flat walls.

4. Cross-referencing with the work of fellow team members

The work for this week was mostly having discussion to decide the servos we will use, the sticky materials and designing the power distribution board conceptually. Nate gave me a hand in designing the conceptual of power distribution board. Songjie also helped me to discover the gecko materials. Brian was working independently on the GUI using Qt.

5. Plans / goals for following week

My future work for the project is to design and develop the electrical system of the robot including the power, main processor, motor controllers and sensors. For the next following week I will help the team to design the schematic of power distribution board, begin casting gecko adhesive material, and testing the servo driver board and the servos we ordered.

6. Figure(s)

Figure 1. Vytaflex 10 to make sticky materials