

**Design Studio #4 - Weekly Progress Report #15**

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In this week, we have tested the previously designed shooting mechanism based on rack-and-pinion. It was basically a gear with some its teeth removed connected to linear actuator with teeth and a spring at the end of the actuator to compress while the gear is rotating. When the step motor rotates once around its axis, it will shoot when the contact between the gear and actuator corresponds to the teeth removed region of the gear. However, upon testing, we realized that the number of the teeth of the gear was too large for our motor since it rotates too fast for the gear. Also, when the gear is separated from the actuator to shoot, the actuator crashes into the gear slowing the shoot down. We understood that the reason for this was the number of theeth. The actuator crashes into the gear since the height difference between two consecutive teeth is very small and the teeth of the gear did not fit prefectly in the actuator holes. Therefore, although the shooting system was successful overall and promises better results, we have designed the mechanism again since the results were not as good as we expected. We have also printed the mechanism in the 3D printer and we will test the system first thing in this week. We are hopeful that we will have a very successful and powerful shooting mechanism in the end.

Also, for the control of the differential drive motors, we have prepared the code considering the sensor inputs and user inputs. The code will control the robot so that it will take its input from the user all the time but get into an interrupt if there is any sensor data indicating risk of collision or stepping on a line and automatically withdraw itself from the risk. For the user controlled inputs, we have divided the cartesian coordinate of the joystick control of the RC transmitter into multiple regions and the robot will move according to the joystick region. For example, if it is directly at the top, both motors will run at maximum speed and the robot will move forward. If it is on the upper right corner, the right motor will run at half speed forward and the left at full speed forward so that the robot will turn right at a wide angle. The tests of this code was performed in this week and it generates correct motor commands in every region. We tested it with two discrete motors and they rotate accordingly. When we integrate the radio controller and the chassis we will test it on the robot itself. We are waiting for the success of the shooting mechanism to finish the robot chassis.

Also, we are researching some mount systems for the FPV camera and the transmitter on the robot. The placement of the camera and the transmitter on the robot is very important since they should be affected by electromagnetic interference generated by all the components on the robot and in the environment. Also, the camera should be placed so that it will have a wide view of the field and can be controlled easily. The transmitter will be placed at the top of the robot with its antenna standing up straight since the antenna has the most gain in its horizontal direction. This donut antenna is an omni-directional antenna but its vertical beamwidth is very narrow so it is only omni-directional horizontally. Therefore, we should be very careful how we place it on the robot i.e. its side should point at the height of a person in 30 meters. The camera will also be place at the top with a 45 degrees pointing downward to widen its view and make the connection with the transmitter easier. Its direction will be controlled by a servo motor. Therefore, we need a servo motor mount to place it robustly on the robot and make the rotation easy. We have found some mount systems on the Internet for our camera but they seem to be out of order. If we can find mount systems appropriate for our camera, we will buy one since we do not want to spend time drawing it. However, if we can not find any, we will draw one according to the dimensions of our camera and 3D print it.(Recep Günay)