Progress Report

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RoboMasters Ammunition Supply Station was expected to involve more computational and microelectronic components, but it turned out to be a *mechanical* design of a multilayer station. In the past month, our team meet with the client to clarify their need and obtain further measurement of the infantry robot that would be using this station. The clients' main concerns are speed and avoiding bullet jamming. The constrains of the project was farther clarified by reading and noting the design constrains imposed by RoboMasters 2017 competition regulation. I expect little changes, if any, to those constrain. These constrains were echoed in the latest group report, "Infantry Supply Station Design for DJI RoboMasters Competition." Additionally, YiFeng Wang and I, we took dimensional measurements of the infantry robot that was developed and used last year. We expect the measurements to change, as a new set of infantry robot is being developed by a mechanical engineering group. We expect to know more about their design in the upcoming month.

Moreover, we have developed a reliable communication, collaboration, and file-sharing channels. For communication between our group, Facebook messenger has been selected. By clients' request, Slack was downloaded and installed to ease our communication with the client. For file sharing, GitHub is being used. I've trained all group members on how to use GitHub effectively and I ensured they have the program installed on their laptops. Additionally, rather than the beloved Inventor Pro, 3DS-Max was selected as the 3D computer aided design tool of choice for our group; since our team member, Xinru Song, was learning that tool at her current job. Efforts to learn 3DS-Max through YouTube tutorials has been made. Further guidelines on submitting documents using uniform fonts were stablished to ease group collaborations. Further, I drafted group rules and it has been agreed to. YiFeng Wang has been a great manager and he frequently sets up group meetings with advisors and clients.

A general idea of the final product has been formed and agreed to. Laser beam breakers were the initial choice of detecting docked robots. Other mechanisms included pressure sensors (which will not be accurate), radio activation of the station (which is not acceptable by client), large push button for the robot, and magnetically induced activation. Our technical advisor suggested using camera and a development board, such as Raspberry Pi, to detect docking, and stressed on clarifying the phrase "docking." This method will increase the costs that may be out of the budget of our group.

3D printing of the main components of the station has been agreed to. Cost of printing, to our group, of golf-ball-sized components is zero, and it could be done at Cameron library. Larger parts can be printed at Edmonton Public library (size limit: 25x21x25 cm) for $0.10 per gram, or at the Mechanical Engineering shop. Machine shopping of components will be out of our budget, as it may require in excess of 20 hours.

Possible cardboard designs of our final product were investigated to evaluate jamming of bullets and we found a "slide" would be the best mechanism of loading ammunition into the station. Low friction and large width and a height of a little over a bullet diameter found to reduce jamming. Aluminum slide expected to work best with TPE-90 plastic bullets. Use of cone-shapes to guide the ammunition is out of our design. Since we found that the force of ammunition above would always lead to jamming of bullets in the cone. We found that even motor shaker-vibrator would not easily avoid the jamming of bullets in a cone. Thus, a slide (of height 2 cm, width of about 7 cm, and a length of about 25 cm) is an acceptable solution. The slide is expected to be at an angle of ~30 degrees, leading to a spatial requirement of about 22 cm, and height of 12.5 cm. The overall height of the station is limited to one meter, and the infantry robot is had height of 39 cm last year. The infantry robot is limited to a height of 70 cm and thus the mechanical engineering group could potentially make our final design more challenging by building a tall robot.