Background

Underground mines are highly dangerous working environments in which employees are exposed to fires, floods, explosions, falling rocks, and deadly gases. The introduction of an autonomous inspection drone into the mining industry will save hundreds of lives every year.

Objective

Design and manufacture an autonomous drone with collision resilience and video recording capability, for underground mine inspection.

Product Specifications

- Protective shock-resistant cage.
- Autonomous drone with payload capabilities.
- Connection of drone to the protective cage.
- Lights and obstacle avoidance sensors.
- Ability to add additional modular sensors.
- Rotational recording and live feed camera.

Final Joint Design

The joints use a pressure lock system combined with the elastic material of TPU to hold the carbon fiber rods together in the spherical cage.

Drone Connection

The drone body is secured onto the modular ring. The drone arms were recreated as a part of the connection ring to increase the overall stability and cohesiveness of the design.

Drone Sensors

The drone is planned to be able to work fully autonomous, in order to do this the team will employ sensors which will give close to a 360 degree reading around the drone. To achieve this, Lidar sensors will be placed around the cage. The flight controller that is being used is compatible with Lidar sensors so no special equipment is needed.

Flight Tests

There have been numerous flight tests of the drone. So far the tests have shown that the drone can lift the weight of the cage. There are a few stability issues that are stemming from the motors or the flight controller.

Future Work

- Implement remaining sensors on cage frame
- Conduct test flight
- Program autopilot
- Design live video feedback process for GPS-denied areas

REFERENCES