CHAPTER IX. EVALUATION OF FIELD-OF-VIEW LIMITATIONS

IX.A. Configuration of the simulation environment

A world file containing the turning circle mesh created to validate the steering controller (see Chapter VI.) was generated. A tower obstacle (see paragraph V.C.2.) was located at a position 5.128 m to the right and 7.128 m to the rear of the representative challenge vehicle model, ensuring the tower was in the path of travel of the model as the model traveled around the turning circle.

With the exception of the 70-degree field-of-view of the Navtech DS2000 RADAR in use by Teams 2005-13 and 2005-14[13], the Epsilon Lambda ELSC71-1A RADAR ("ELSC71-1A") has the widest field-of-view of any navigation RADAR in use by teams participating in the 2004 or 2005 GCE. To simulate and visualize the field-of-view limitations of the ELSC71-1A, the world file was revised to attach a SICK LMS 200 LIDAR model to the representative challenge vehicle model with field-of-view characteristic of the ELSC71-1A. The ELSC71-1A has a field-of-view of +/- 20 degrees in wide-scan mode. This corresponds to a maximum distance between the path of travel in a constant-radius turn and the left- or right-limit of field-of-view of 0.400 m. The SICK LMS 200 LIDAR model file was revised to limit the field-of-view to +/- 20 degrees.

The representative challenge vehicle model file was revised to set parameters `useConstantSteeringAngleMode` to `TRUE`, `constantSteeringAngle` to `-0.3764`, and `useSafeVelocity` to `TRUE`.

IX.B. Simulation procedure

The author started Gazebo, started Player, started the `playerv` utility, and observed the model as it accelerated through the turning circle toward the tower.

IX.C. Results

See Figures 17, 18, and 19. As predicted, the field-of-view of the simulated ELSC71-1A was not wide enough to detect the tower obstacle located 0.5 m from the representative challenge vehicle path of travel. As a result, the obstacle was not detected, virtually guaranteeing a collision.

IX.D. Conclusions

The author concluded Player and Gazebo could be used to effectively visualize sensor field-of-view limitations successfully. This may have eliminated the use of navigation RADAR as a primary obstacle detection sensor, reduced cost to the teams, and enabled less experienced teams to more effectively visualize the interaction of their challenge vehicle with the environment.