NIKE Yellow Arena Experimental Setup & Data Collection: December 2006

I. Sensor Setup and Mounting Arrangement

A 4 swivel-wheel "mobile quadrapod" mounting arrangement that houses the 2D LADAR (SICK)[1], its power supply, and cables was used. A laptop mounted on a separate cart connected to the LADAR via a USB-Serial converter for data-logging.

Figure 1 shows the mounting arrangement. The tilt can be tilted downward (or upward) or can be left straight (scanning parallel to the ground; corresponds to a pitch angle of 0^o).

(a) Scanning parallel to the ground (pitch = 0^o)

(b) Scanning parallel to the ground (pitch 0^o): Closeup

Fig. 1. Sensor mounting arrangement.

II. Data Collection Methodology and Conventions

The data was collected in a 'maze' environment (see photos and movie; these are representative of the environment but NOT the actual environment).

Note that

- the scan positions are unknown,
- the ground can be assumed to be flat (no pitching or rolling of the sensor while data was collected), and
- the scan positions are consecutive and the traversed path is in the form of a closed loop (meaning some of the areas previously scanned are revisited) but the start and end positions are not the same.

A. Data Format

Column 1 is scan index, Column 2 is yaw angles, and Columns 3-403 are the range values (in cm).

For every scan location, there are four sets of SICK range data as we collected data in four directions corresponding to angles θ_1, θ_2, θ_3, and θ_4 (more on $\theta_1 - \theta_4$ below).

There are 16 scan positions and accordingly you will see 64 rows of data.

B. Angular Conventions and Range Values

For every scan position, there are four scans: 0^o, 90^o, 180^o, and 270^o in that order; the convention follows a right-handed system viz. 0^o is parallel to the X axis and 90^o is parallel to the Y axis and so on.

The SICK scans a semi-circular arc of 100^o in angular increments of 0.25^o from right to left and parallel the ground.

Accordingly, for example, the 0^o scan's scanning envelope runs from -50^o to $+50^o$ thus resulting in 401 pts/scan.

$$\theta_1 = [-50^o : 0.25 : 50^o]\,;\% \text{ corresponding to the } 0^{\text{o}} \text{ scan}$$
$$\theta_2 = [40 : 0.25 : 140];\% \text{ corresponding to the } 90^{\text{o}} \text{ scan}$$
$$\theta_3 = [130 : 0.25 : 230];\% \text{ corresponding to the } 180^{\text{o}} \text{ scan}$$
$$\theta_4 = [220 : 0.25 : 320];\% \text{ corresponding to the } 270^{\text{o}} \text{ scan}$$

[1]Commercial equipment and materials are identified in this paper in order to adequately specify certain procedures. Such identification does not imply recommendation or endorsement by the National Institute of Standards and Technology (NIST), nor does it imply that the materials or equipment identified are necessarily the best available for the purpose.