HOCHSCHULE BREMEN
UNIVERSITY OF APPLIED SCIENCES

Master 2015

Vinod Kumar Reddi

Head Position Tracking Using Ultrasonic Sensor.

ABSTRACT - Masterthesis

In this thesis a low cost method for three-dimensional (3D) head modelling is carried out. Translational and rotational parameters of the obtained model are calculated. Head tracking using the camera orientation system was already developed. This system is complex and expensive. To overcome the cost and complexity of the system, head tracking using the ultrasonic sensor system is proposed. Ultrasonic sensor HC-SR04 and Arduino UNO microcontroller are used in this thesis to track the position and orientation of the head.

The ultrasonic sensors are placed around a dummy head to measure the distances between the head and the sensors. Using these values a two-dimensional (2D) point cloud of the head is obtained. This process is continued at an interval of 1cm along the vertical direction (longitudinally). 2D layer is calculated by numerically stable direct least squares algorithm. The position and orientation of the ellipse are calculated. 3D point cloud is formed by combining all the 2D point clouds of the head. Superquadric model fitting algorithm is used to model the head from the obtailed point cloud data. The position and orientation of the superquadric are calculated from the translational and rotational parameters of the superquadric.

The result of this project can be a reference to encourage further research to alert the car driver from collisions. It is also useful for tracking human head in human-robot interaction application.