**Abstract**

Interactive spherical map project aims to help people get around more easily in dense city areas and tourist attractions. Furthermore it is a suitable project to learn more about mechatronics, kinematics and control systems. We used three omni wheels to give spherical object three degrees of freedom, which means that it can rotate around its 3 axis simultaneously. The experimental Lego prototype we made showed that the kinematics we used are valid.

**Motivation**

Spherical map will be usefull to create a user friendly gps system so people can get oriented easily in touristic areas as well as an interactive learning environment for students.

**Experimental Set-up**

- Omni Wheel
- Lego Ev3 micro Computer
- Lego Ev3 large Motor
- Size 3 mini-basket ball with path
- Motor mount made with lego parts

**Kinematic Model**

\[
\begin{pmatrix}
\omega_{w1} \\
\omega_{w2} \\
\omega_{w3}
\end{pmatrix} = \frac{J}{I} \begin{pmatrix}
0 & \cos(\theta) & \sin(\theta) \\
-\frac{1}{2} & -\cos(\theta) & \sin(\theta) \\
-\frac{1}{2} & \cos(\theta) & \sin(\theta)
\end{pmatrix} \begin{pmatrix}
\omega_b \\
\omega_b \\
\omega_b
\end{pmatrix}
\]

- $\omega_w$: Rotational velocity of the wheel
- $\omega_b$: Rotational velocity of the ball

**The Control System**

We implemented a PID controller through simulink, tuned it by trial and error to help stabilize the system. PID control is a open loop control system that most of the systems use today.

**Results and Discussion**

- The real experiment showed that our kinematics are valid. The ball was able to complete the path. However due to the vibrations and overall stability of the structure there were mistakes. This can be improved by making a proper platform from metal sheets.
- At the end of this P.U.R.E project we learned basics of kinematics, control systems and how a research is done.