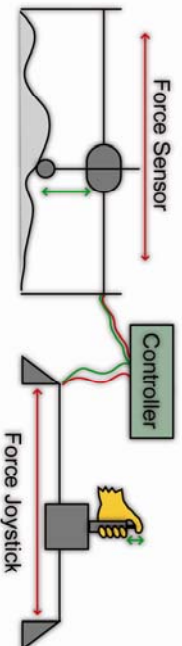


Design and Control of a uniaxially moving force sensor for a haptic joystick / force sensor couple

Background

The task was to design and construct one part of a haptic joystick/force sensor couple, the Force Sensor. The other part the Force Joystick was made by Ahmad Zulkapli. The Force Joystick can be moved by hand in the horizontal direction. Those movements are recorded by a position sensor. That position sensor is used to control the horizontal movements of the cart on the Force Sensor. The cart carries a sensor that measures the topology of the object beneath it. That sensor is used to control the knob on top of the Force Joystick.



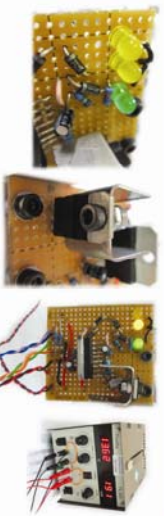
Mechanical Design

Mechanical design, to design a cart which can move in horizontal direction above a surface. The cart carries a vertically moving force sensor. A gear system will convert the vertical movements of the sensor to rotary motion to be able to record it by a potentiometer. The cart has to be accurately positioned by a motor using a gear and pulley system.



Electrical design

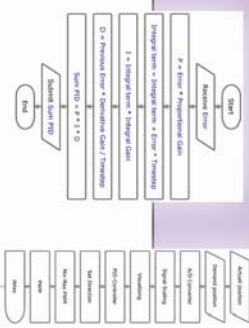
Electronic design, to design a control circuit for the position controlled motor. The circuit makes it possible to control the direction and speed of it. Moreover choosing control hardware, which connections are going to be used and wiring of the system.



Control design

Control design, to model and design a controller that uses the horizontal position signal from the Force Joystick to control the position of the motor that moves the sensor cart.

Important control functions are a PID-controller, A/D converter, possibility to set the rotary direction of the motor and a PWM generator.



Integration

Integration, to assembly the mechanical parts including gear and pulley system. Soldering the electrical circuit and connect the input and output signal wires to the controller. Tune the controller to give the system a desirable response.



Conclusion

At the end of the project the both parts will join together to become a completed haptic force sensor couple. And it will be possible to sense by the knob the variations in the surface while horizontally moving the Force joystick.

