Gwenn Flores
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Alexander Thieke
E322 - Homework 6

Enhanced Human Machine Interaction project

Section 1:

Individual contributions:

Alexander

-Worked on function-means tree

Jiaren

- Constructed black box and transparent box

Shinji

- Provided detailed description of function-means tree diagram

Gwenn

- Provided detailed description of black box / transparent box diagrams

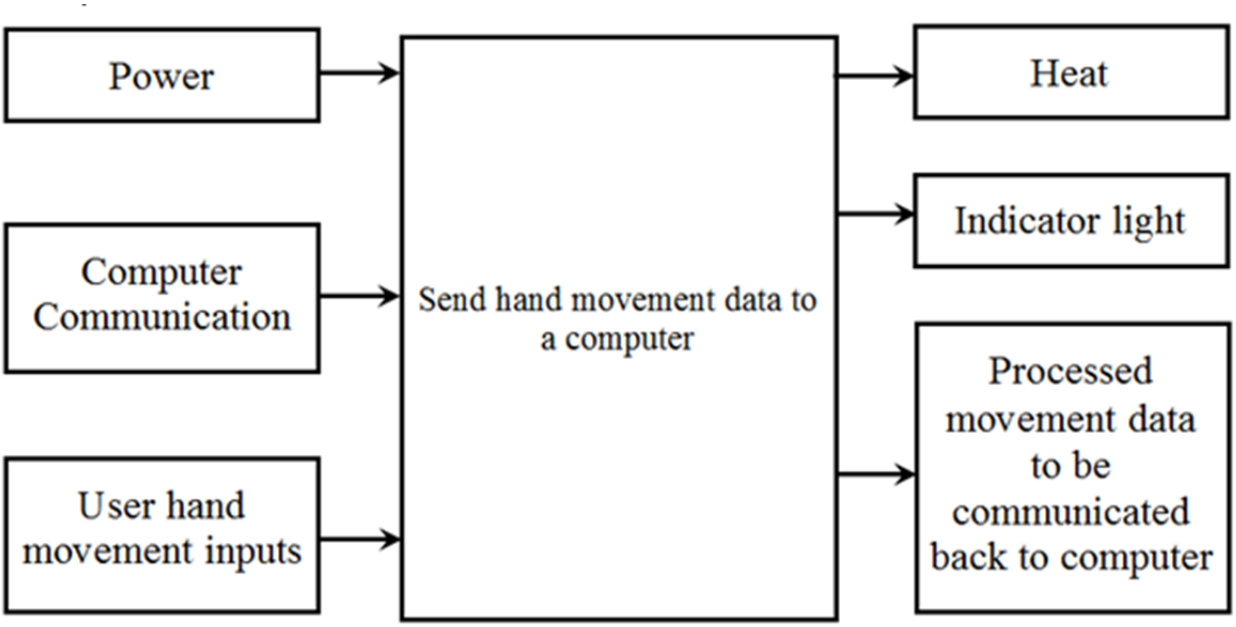
	Jiaren Li	Shinji Sato	Alexander Thieke	Gwenn Flores
Percentage of effort toward this assignment	25 %	25 %	25 %	25%

Section 2:

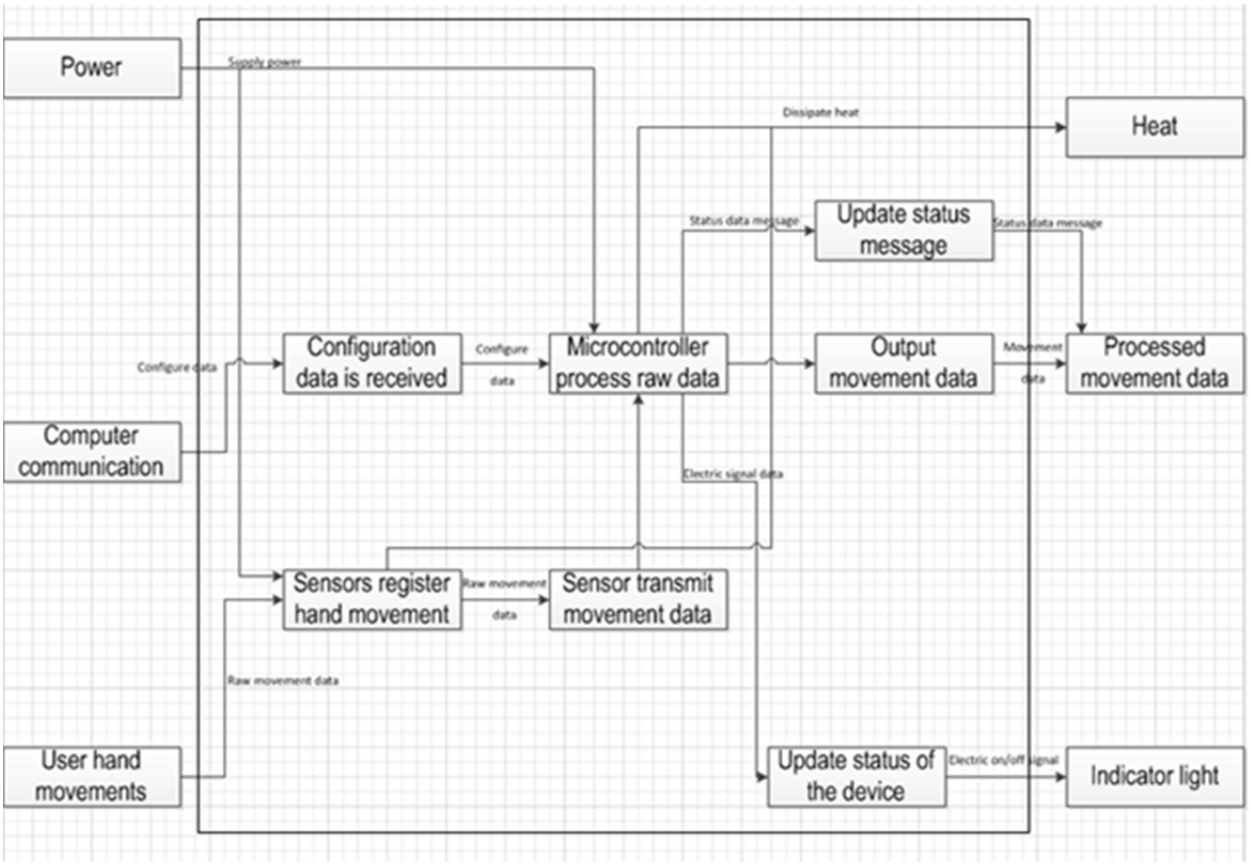
Overview:

The overall functionality of our human-machine interaction project is to be able to capture the user's hand movements in 3D space and relay the gesture and/or positional information to a computer.

Diagrams:

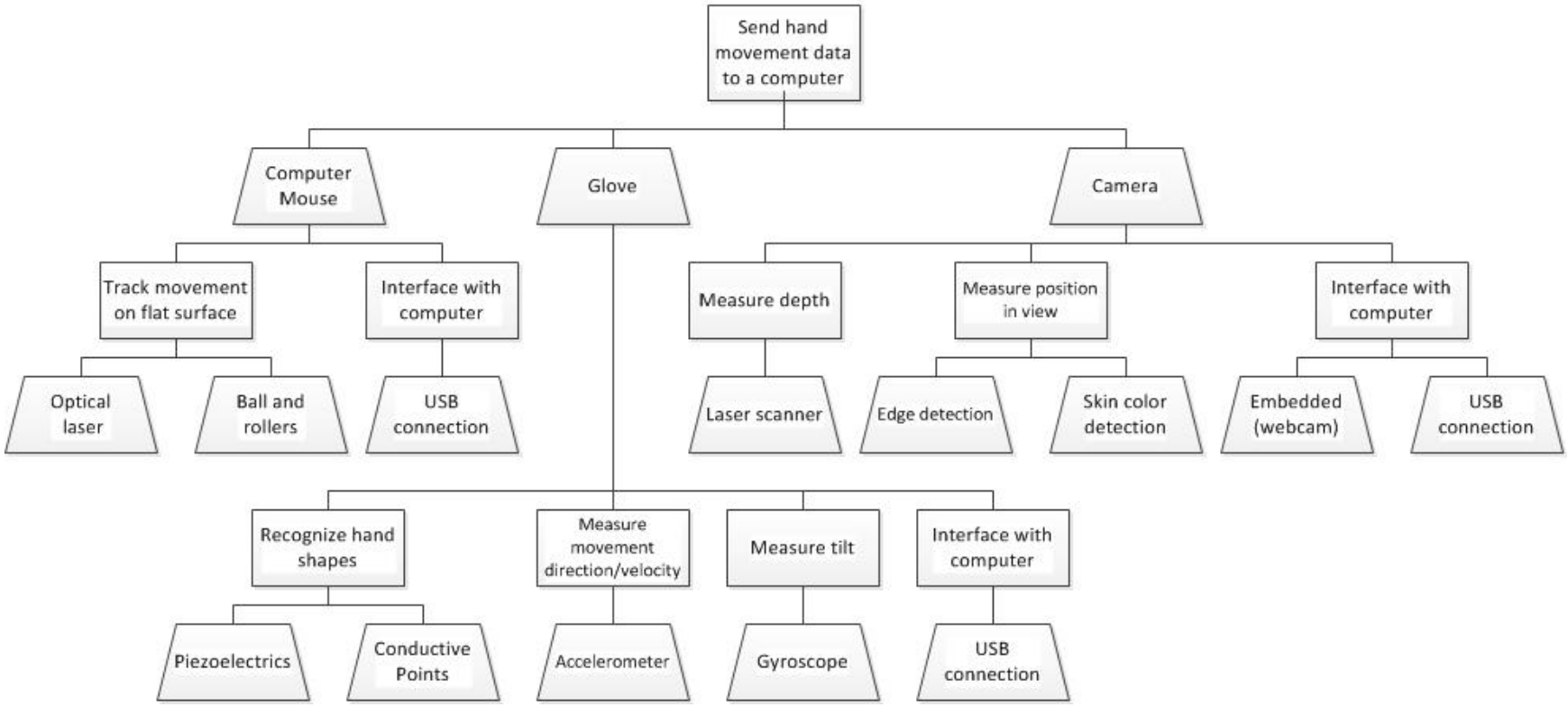


The black box



Transparent box

Function-Means Tree



Discussion:

Black Box / Transparent Box Diagrams:

The black box diagram displays a high level view of the basic components needed for the human-machine interaction project. On a lower level view, the transparent box diagram provides a more in-depth explanation of how hand movement data is processed in a computer. The inputs required are power, computer communication, and user hand movement. Power provides the main source of energy for the device. The primary entities requiring power in the device are the microcontroller and movement sensors. Computer communication provides configuration data into the microcontroller. The configuration data is the data needed for the microprocessor to process raw input data. When user hand movements are read, the raw movement data is registered by the system's sensors and then transmitted into the microcontroller for processing. Once the raw data has been processed, a status message is updated via a data message. An electric signal data is also transmitted, updating the status of the device and triggering an indicator light that reflects the updated status. The movement data that was processed by the microcontroller is outputted as processed data and can be communicated back into the computer. Because energy is required to fulfill all interactions, heat is dissipated and produced as a byproduct.

Function-Means Tree Diagram:

The function-means tree diagram displays various methods to transmit hand movement to a computer. Each level down the tree expands on details or methods from the previous. The three methods recorded are a: computer mouse, glove, and camera. The computer mouse represents a widely used communication device that tracks movement on a flat surface. The primary functions that create positional data consist of optical lasers and ball and roller. The data generated is fed to a computer through a USB connection. The glove interface represents the improvement to the mouse human-machine interaction. It can be used to recognize hand shapes, 3-D movement, and tilt. The glove can recognize hand shapes and contractions through piezoelectric or conductive point sensors. 3-D position and tilt can be tracked by accelerometers and a gyroscope. After the data has been processed by the onboard microcontroller, the data is sent via USB to the computer. The camera interface represents an emerging human interface technology that could potentially augment the glove design. Depth is measured by a system of lasers hitting the target in question. Unprocessed distance data is returned with the laser's reflection. Position is measured through various image processing techniques such as edge detection and skin color algorithms. Data can be fed to the computer through a USB connection or be directly embedded in the computer's architecture.