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Version history

Version	Date	Person	Note
V0.1	15-03-18	Jesse Bouwman	

1. Preface

The primary interaction method to communicate with ‘Willy’ will be by voice recognition. When voice recognition is not available an second communication method is required. Voice recognition may not work well in a noisy environment. With a second communication method, ‘Willy’ is also able to communicate to people with speech or hearing problems. In this document, possible solutions will be researched.

2. Leap motion sensor

The leap motion sensor is a 3D motion and gesture controller. The device contains three infrared LEDs and two infrared cameras. The cameras catch the reflection of the infrared LEDs at a rate of 200 frames per second. (Leap Motion, sd) The Leap Motion sensor has an accuracy of 0.7mm. (Frank Weichert, 2013)



Figure 1: Leap Motion Controller

The Leap Motion could be useful as an alternative for the touchscreen. Gestures and motion can be detected and with this Willy can be controlled. The Leap motion is usable without installation.

3. Kinect Sensor

The Kinect V1 is a device which contains an infrared emitter, an infrared Depth sensor, a color sensor, four microphones and a 3-Axis accelerometer. (Microsoft, sd) Infrared is used to measure distances to objects. In combination with the color sensor it creates a RGB image with depth.



Figure 2: Kinect v1 Sensor

The four microphones can detect sound and even the location of the sound source and its direction. The 3-Axis accelerometer is used to determine the orientation of the Kinect sensor.

For interaction Willy could use a Kinect to look for gestures for controlling Willy.

The benefit of using a Kinect V1 is that it is widely used with other robots. Because of this Willy could use the Kinect for mapping and localization as well as secondary interaction with the screen. The mapping while driving and the interaction when Willy is stationary.

4. Touch screen

A touch screen can be used for controlling Willy. The current screen Willy uses is a touchscreen but uses way too much power. There are options which have touch included and use less power, but these are expensive.

Another option is a bracket which can be applied to a non-touchscreen to make it touch-sensitive. With this option Willy could use every display that is on the market with only the added bracket for touch.



Figure 3: Infrared Touch Frame

These touch frames work with infrared to measure the distance to for example a finger and uses this for its touch input. The touch frame is connected using USB and works plug and play with only the need of calibration.

5. Touch pad

A touchpad like a laptops touchpad is the easiest and cheapest way to communicate with Willy. There are versions with a keyboard and mouse in it. These versions can do everything what an ordinary mouse and keyboard could do.



Figure 4: Example of a touchpad

6. Conclusion

The Leap motion is a medium prized alternative for interaction with Willy. It is easy to understand and can be used without practice. Because of its fast measurements the Leap is reliable to use as a second interaction method.

The Kinect V1 is cheap to buy and is already used in other robots for gesture recognition. A disadvantage of the Kinect is that it requires a lot of performance from the mini-pc.

The touchscreen or touchscreen infrared frame is an option for precise tracking of multiple fingers. They are however more expensive than the other options.

The touchpad is the easiest and most affordable option of them all. Everyone knows how to use it and it is reliable. It works without installation when plugged in the USB-port of the mini-pc. Another benefit is that the touchpad uses the least power of all other options.

The advise is to use a touchpad at this state of the project. Because this project is all about prototyping, a cheap and reliable alternative might be the best idea.

7. References

- Frank Weichert, D. B. (2013, May 14). *Sensors*. Retrieved from National Centre for Biotechnology Information: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3690061/Leap> Motion.
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