Prototyping a gesture controlled Head Up Display using a Leap Motion

Daniel Brand
University of Salzburg
Salzburg, 5020, AUT
Daniel.Brand@stud.sbg.ac.at

Kevin Büchele
University of Salzburg
Salzburg, 5020, AUT
Kevin.Buechele@stud.sbg.ac.at

Abstract
In todays cars, the design of a Head Up Display (HUD) and the arrangement of its components are rather fixed. This paper provides an approach how a Leap Motion can be used to achieve a gesture controled HUD. Furthermore, some aspects that need to be considered when implementing a modifyable HUD for cars are discussed.

Author Keywords
LeapMotion; HUD; Head Up Display; Automotive; Gesture recognition

Introduction
During the last years, the HUD display has been established in middle and high class cars. However, Head Up Displays are rather static, in particular, the position of each element in the display is fixed.

Nowadays, users of any devices appreciate an interface which can be modifyed. Since buttons or similar controls may distract the driver from looking at the road, these types of controling the interface are rather bad choices.

After doing some research, we came to the conclusion that a touchless control (similar to other approaches to control a infotainment system) may be a reasonable goal we want to

achieve.

A classic device to implement touchless controls is the Leap Motion. We use the Leap Motion and furthermore gestures which are easy for the user and also easy to be tracked by the device. In this paper, we will discuss problems and issue we have faced regarding the position of the Leap Motion, which gestures to use and more important which settings/requirements have to be fixed in order to get the system working smoothly. By the end, we can select items within a HUD without any other devices such as a touchpad, etc.

The system's environment

The Leap Motion is a classic sensor device to track the hands of a user and therefore his gestures. The detection of the hand works with an infrared camera which has the advantage that environment light which would generate noise in the information are reduced. The sensor recognizes each finger including bones and joints, which gives the possibility to process data of a single finger, which we are using in our approach (details are described later). So far, our system has been configured to work with a right hand only. For now, there is no support for left handers.

Our HUD will be simulated with the help of the JavaFX framework. In order to test which settings fit the most for this use, we are able to dynamically display 3-5 elements in our HUD, simply represented with numbers between 1 and 3 (respectively 5). Certain gestures above the Leap Motion will cause an interaction with the JavaFX window. The Leap Motion is set up to track 2 major gestures: pointing at a certain field (see figure) and selecting it by moving the pointing finger slightly in direction to the HUD. In the case of our prototype, the Leap Motion Listener and the display are running on the same computer.

The angles between finger, Leap Motion and HUD have to be ajusted accordingly. This is because we are using the interface with the right hand, more specificly the right pointing finger, only. Obviously, the anatomy of our hand allows a slightly bigger movement range of the finger to the left instead of the right. This needed some testing, and we came to the conclusion that the angles have to be ajusted within the program in order to achieve a satisfying control of the HUD.