THE DEVELOPMENT OF AN INTEGRATED DIRECTION INDICATOR FOR RACE BIKES.

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Introduction

Race cyclists form a risk group in traffic, since they reach higher speeds and are often overlooked since they are bent over. Moreover, they often have bad lighting and barely indicate direction while turning. In 2016 a race cyclist was involved in 11 percent of the bicycle accidents in the Netherlands, resulting in a hospitalization for 4700 race cyclists [1]. These numbers are shockingly high since the Netherlands is one of the most bike friendly countries in the world and the degree of participation of race cyclists in traffic is far below 11 percent. Especially indicating direction was problematic. Because race cyclists lean with a big part of their weight on their handlebar, it is very difficult for them to stick out one hand and steer through the bend in the road. It turned out that until now there was no good solution for this problem on the market, so the developers decided to combine their experience in the field of electronics and 3D printing in to develop a direction indicator installation especially for race bikes. This system enables race cyclists to communicate with the other road users, without taking their hands off the handlebar.

Research Methods

First the competitive position is determined, which means that comparable systems, which are already on the market, are precisely analysed. The good points of these systems are retained, the bad points are improved. This finally results in a vision on the ideal direction indicator for race bikes. This system must at least be able to form brake lights, turn signals, and warning lights and must be integrated in the handlebar of the race bike, contain both front- and rear light, be visible from all sides, easy to operate, cheap to produce, light, and have an aerodynamic design. Determination of the appropriate components and techniques followed. For example, the brakes of the bike are used to operate the system, which are connected to this system and will work as a capacitive sensor. This principle can be found in the touchscreen of smartphones and is used in this case to detect whether or not the user touches the brakes. So, by tapping in a certain pattern on the brakes, the user can give commands to the system. Next, all the collected components are combined in a circuit diagram and a resulting prototype of the electronic circuit. Based on this first prototype a number of points of improvement are determined, which will be processed in the next three circuit diagrams and prototypes. With the last prototype all components are soldered on a printed circuit board. The left picture of figure 1 shows the 2nd prototype of the electronic circuit. In the next step a 3D model is made of the modules, which will be installed in the frame. This model can be seen in the right picture of figure 1. The system consists namely of two modules that each will be mounted in the openings of the handlebar. The ends of the modules form the red rear lights, the small caps underneath form the white front lights. Each module consists of four parts, which are printed by a 3D printer out of white and transparent plastic.

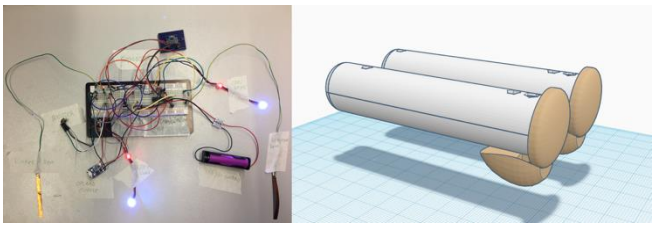

Figure 1: prototype II (left) and two modules (right)

Result

The end result is shown in figure 2, the electronics and the housing are brought together and the modules are mounted in the handlebar. When pressing one of the brakes

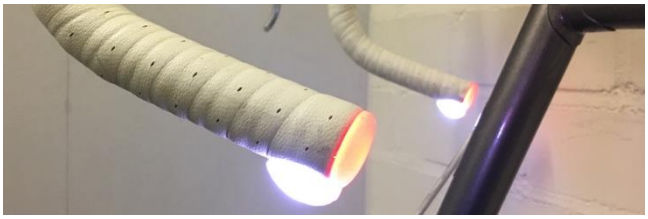

Figure 2: the two modules mounted in the handlebar

there will be brake lights visible and the red rear lights on both sides are burning more brightly. By tapping twice on one brake a turn signal will appear on the side of that brake and the front and rear lights will flash orange. The lights will change to normal white and red automatically after turning left or right because the built-in gyroscope detects that the bike went from a tilted to an upright position. By tapping three times on one of both brakes warning lights will appear and the front and tail lights on both sides will flash orange. By tapping four times on one of both brakes the battery level is shown, in that case all lights will fade from red too green. The closer to green, the fuller the battery is. The system can be turned off by tapping five times on one of both brakes and can be switched on mechanically by pulling on the cap of the left module. The system can be charged by the built-in USB port, which can be reached when the left cap is turned away.

Conclusion

It was possible to create an integrated light system for a race bike, which could give turn signals, break lights, and warning signals.

Literature

[1] Valkenberg, H. (2017) “bike accidents in the Netherlands”