

**BOSCH**

Invented for life

## Bosch Sensortec

### Bosch sensors inside

A revolution in rehabilitation:  
The smart glove

#### LENDING A HELPING HAND

We are born with two hands; one to help ourselves, and one to help others. Bosch Sensortec provides solutions for problems in all areas of high-tech industry; from virtual reality to rehabilitation. This is exactly the scenario with a new use-case that utilizes the functionality of the BNO055 sensor from Bosch Sensortec: smart glove. Gernot and Simon, two students aged 17 and 18, created an interactive rehabilitation glove that includes the Bosch Sensortec BNO055 Absolute Orientation Sensor to train the user how to regain lost function in the hands. These prodigies have developed a powerful solution for the field of rehabilitation for young people, which can often be monotonous, repetitive, and outright tedious. Their concept consists of two parts: the smart glove, and the Oculus Rift virtual reality headset, to ensure an enjoyable and productive rehabilitation experience.

#### HUMBLE BEGINNINGS

Simon and Gernot began developing the smart glove prototype when they were only 15 and 16 years old, using only a garden glove and a rigged motor. However, their project gained purpose after their friend experienced an unfortunate motorcycle accident that caused him to lose function in his hand. Their friend's rehabilitation experience was discouraging as he was forced to repeat the same tiring movements again and again. This personal motivation enabled them to work long and hard on this project from their makeshift home laboratory located in a converted playroom.

#### THE SOLUTION

The glove coaches the user to open and close their fist which aids in rehabilitation, and allows the user to truly feel the virtual world. Along with the physical device, Simon and Gernot developed a virtual reality game for the rehabilitation process. Together with the Oculus Rift, the user can step inside the virtual world and play this game using the smart glove. By opening and closing the fist, the user is able to pick up and



Gernot impressed Bosch associates with his profound technical expertise while presenting the functionalities of the interactive glove.



Gernot and Simon visited the Bosch Sensortec headquarters to present the interactive rehabilitation glove based on the BNO055 sensor.

drop items into a connect four like chamber, and the glove will orient them to produce the correct hand movements. These bright young makers interviewed physical therapists, doctors, and psychologists in order to gather concrete information from experts to improve their product. They have used the BNO055 sensor in their PCB design to deduct the absolute orientation of the patient's hand. These young men utilized outside resources for help in funding the creation of their device; however, they achieved the know-how entirely on their own.

### BOSCH SENSORTEC'S ROLE

Bosch Sensortec provided Simon and Gernot with the BNO055 absolute orientation sensor, which enabled them to successfully integrate the smart gloves with the Oculus Rift virtual reality head-set. They researched various maker-blogs, and conducted interviews with software design experts; all of whom exerted that the BNO055 sensor was the optimal choice for their project. The BNO055 sensor with the integrated sensor fusion software providing absolute orientation as output was the essential feature they required to accurately integrate smart gloves with their virtual reality game.

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Simon and Gernot needed the BNO055 sensor mainly because of the sensor fusion algorithm which does the processing of raw sensor data in the cortex M0 processor and providing them with the absolute orientation data in terms of Euler angles and Quaternions. Because the sensor comes with fully programmed sensor fusion software, it had enabled them to concentrate more on their application rather than in developing their own algorithm to process the data from discrete sensors. These two young men created a device that solves an impactful problem for people who have been affected by any circumstance that have caused them to lose function in their hands; and Bosch Sensortec was happy to support them.

### AWARDS AND RECOGNITION

Simon and Gernot have won a variety of awards for their interactive rehabilitation gloves, as well as having received recognition from different institutions around the world. They took part in five Jugend forscht competitions, and won first place three times. Additionally, they received five special prizes for a total of nine awards and acknowledgements. These young men were also invited to present at GamesCom – the world's largest trade fair and event highlight for interactive games.

### WHAT'S NEXT?

These young makers have already achieved so much in the world of virtual technology and rehabilitation; however, they don't plan to stop there. Simon and Gernot hope to found their company, Cynteract, once they finish college; they also hope to introduce a do-it-yourself kit for the maker community, in order to make this product available for a broader audience. Although we are all born with two hands, one to receive help and one to offer it, it is evident that these young men use both of their hands to help others in need.

**LEARN MORE ABOUT THE BNO055  
SENSOR ON OUR WEBSITE!**

**VISIT CYNTERACT.**