Geometric Image Processing Laboratory

COMPUTER SCIENCE DEPARTMENT

TECHNION Israel Institute of Technology

B-Glove 3D

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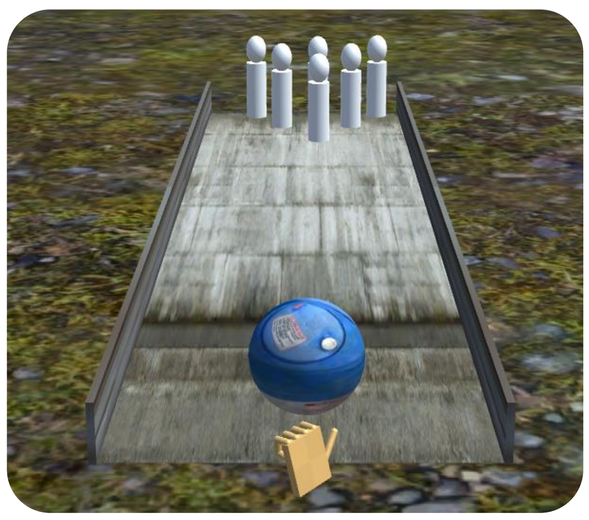
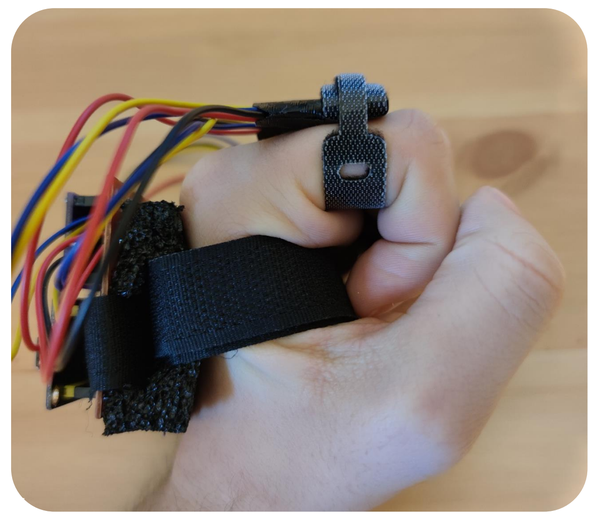
Introduction

As the development and usage of VR and AR technologies increased in the last years there isn't yet a cheap and precise solution for **finger-tracking** problem.

This follow-up project designed to continue the work we have done as members of the B-Glove hardware and software teams. In our main project, we looked for creating a solution for the finger-tracking problem using IMUs (Inertial Measurement Unit) located on the fingers and the back of the hand.

With the help of IMUs, we were able to determine the orientation of each finger and the entire hand. These orientations are sent to the computer which displays a 3D hand in Unity scene.

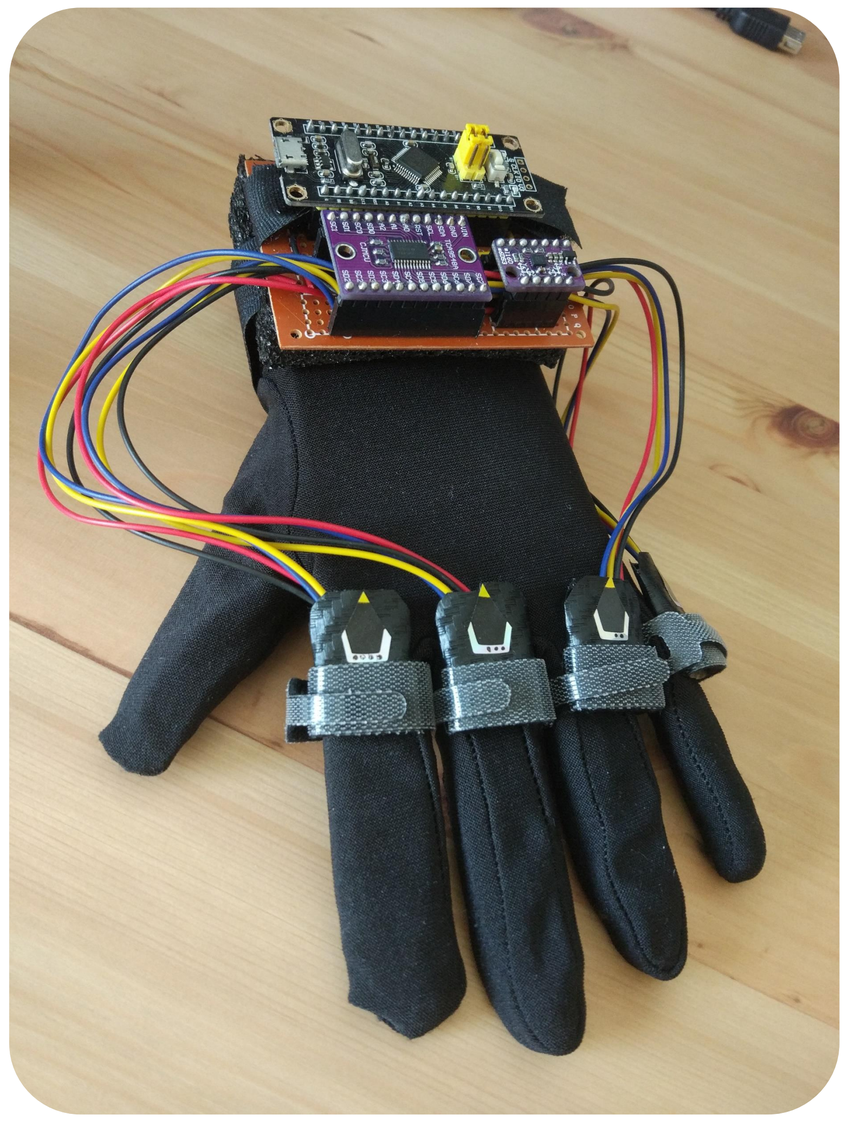


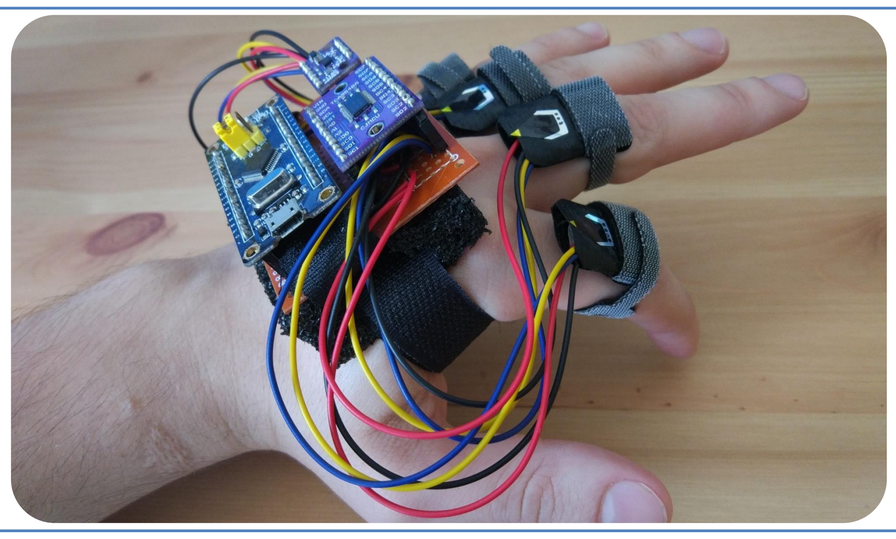


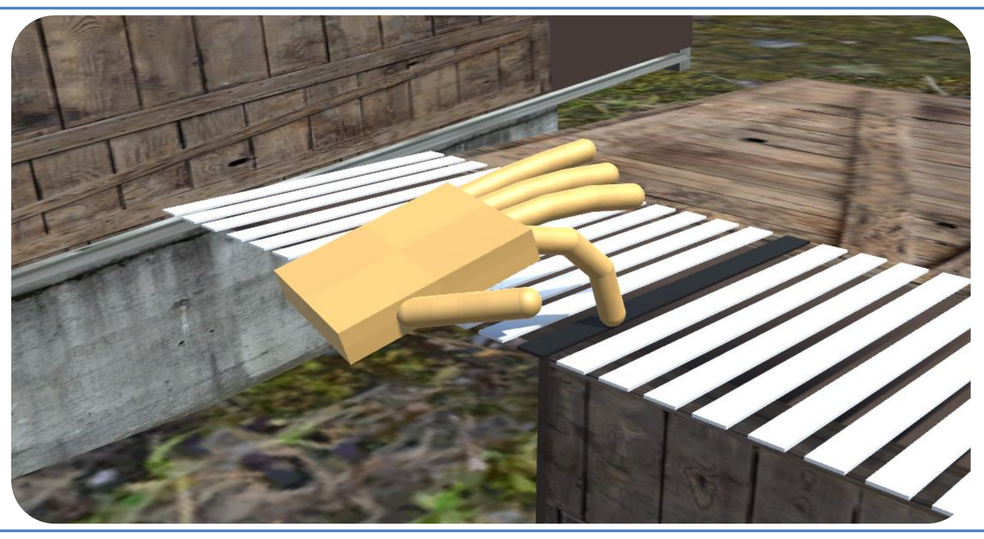
IMU Orientation to Finger Orientation

The issue - 1 IMU for the 3 parts of the finger:
Each finger is composed of **3** little parts. In our Unity scene, every part of each finger needs to know how to behave according to the **1** orientation we get from one IMU on each finger.

The solution - simplification of the hand movement:
The way we handled this issue was to think as every one of the 3 finger parts as basically the same. We gave one script to each finger and all parts used the same logic. This was possible due to simplification we thought of in the hand movement.
The simplification is that a normal finger posture is attributed with the same angle (more or less) for each finger part. For example, if we want a full closure (punch) posture so the first part of the finger will be 90 degrees rotated from the palm, the next part will be 90 degrees from the first part and the same for the last part.
Of course, we are losing some finger abilities with this simplification, but the overall movement is compatible with the actual glove.







Components

- 1 x TCA9548 A Low-Voltage 8-Channel I2C Switch
- 5 x BMI160 Small, low Power Inertial Measurement Unit
- 1 x STM32F103C8 Mainstream Performance line, ARM Cortex-M3 MCU with 64 Kbytes Flash, 72 MHz CPU, motor control, USB and CAN