CS-358 Project proposal

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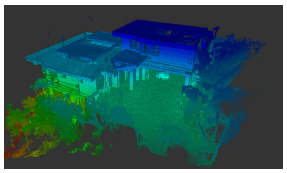
Base idea - 3D laser point cloud scanner.

1 Introduction

Our project idea is about a to design a 3D laser point cloud scanner. There already exist commercial products 1a but they are quite expensive and design for highly professional uses like architects. Our idea is to design a cheap version of it, obviously less precise and less efficient but a project destine to amateur users like us. The goal of this project is also to achieve an open design that can be reproduced easily. An idea of the expected result is shown on the image 1b.

(a) Leica 3D scanner



(b) House scanning

2 Base parts overview

- A tripod (to buy)
- A base platform, mounted on the tripod, capable of rotating 360 degrees (right-left), 180 degrees (up-down). 2
- A laser distance sensor and/or a camera sensor attached to this based.
- A Hardware communication devices to export the data to a computer over Bluetooth or WiFi.
- A software handling the sensor settings and analyzing and processing the raw data, on top of it an exporting feature, optionally a render option.

3 User expectations

- Being able to calibrate the sensor
- Choose the resolution of the 3D scan
- Having a reasonable scanning delay
- Clean the data, also make sampling interpolation.
- Transform the raw 3D points to triangles and therefore optionally add a 3D render using open libraries such as wgpu in Rust or openGl in c++.
- Being able to export the point cloud to some 3D extension.
- Easily portable and dis mountable.
- (upgrade) sampling from different points and connect the cloud points in a single file.

4 Technical details

4.1 Sensor support

Use of 2 step motors with high angular accuracy.

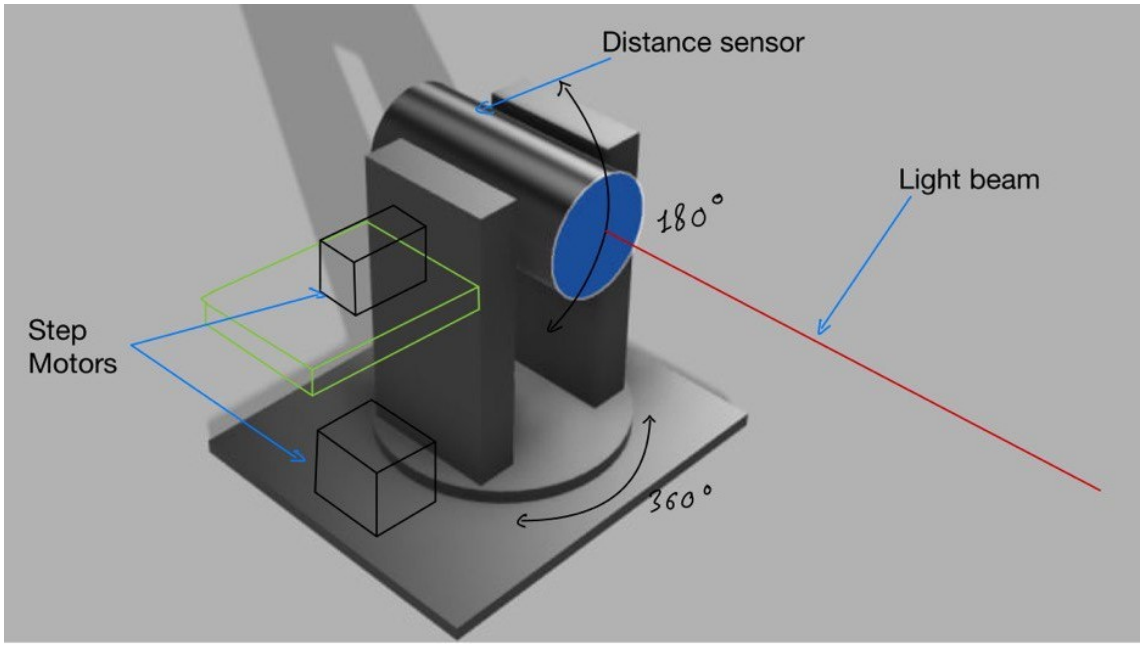
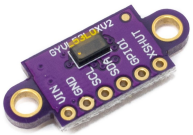


Figure 2: Sensor support

4.2 Sensors

- laser VL53L0X, VL53L1X Arduino (≃ 10 CHF) 3a
- TFMini Plus - Micro LiDAR Module (≃ 60 USD)3b
- (upgrade) position tracker



(a) VL53L0X

(b) TFMini Plus

Figure 3: Sensors

5 Long term view

This project would be an finished product. At the end of the semester the project would be sufficiently advanced such that, taking into account our sensors capabilities, motors speed etc ..., no major improvements would be possible. There is no commercial perspective of this project since there already exist many companies offering this type of products. Our goal is to achieve a budget friendly version of it, and make it open source to be reproducible by anyone.

6 Budget

This project fits well the budget envelope of 250 CHF since we would use less precise but cheaper sensors than the manufactured product. Highly precise and fast acquisition sensors tend to be 10-100 times more expensive that the one cited above 3, they are therefore not suitable for this project.

7 Resources

- Leica 3D scanner for architects: website
- Existing arduino project website
- Distance sensor website
- 3D scanner usage video
- TF Mini plus sensor website
- Tripod example website
- WGPU library website
- House scanning image image source