

INTRODUCTION

The ongoing civil war in **Myanmar**, has severely impacted the Burmese healthcare system which has sent an estimated **1.5 million** refugees to Thailand to seek medical aid in the past 2 years. Without official immigration status, many refugees cannot access healthcare.

Challenges:

- Burma Children Medical Fund (BCMF) is a nonprofit based in Mae Sot, Tak, Thailand that focuses on funding medical treatment and support services, including accessible prosthetics for refugees who have experienced limb loss.
- The staff at BCMF have limited CAD experience so they cannot design prosthetics to fill their gaps.

Solution:

- Queen's Biomedical Innovation Team (QBiT) at Queen's University is a student-led biomedical engineering design team that has started a prosthetic project to support them.

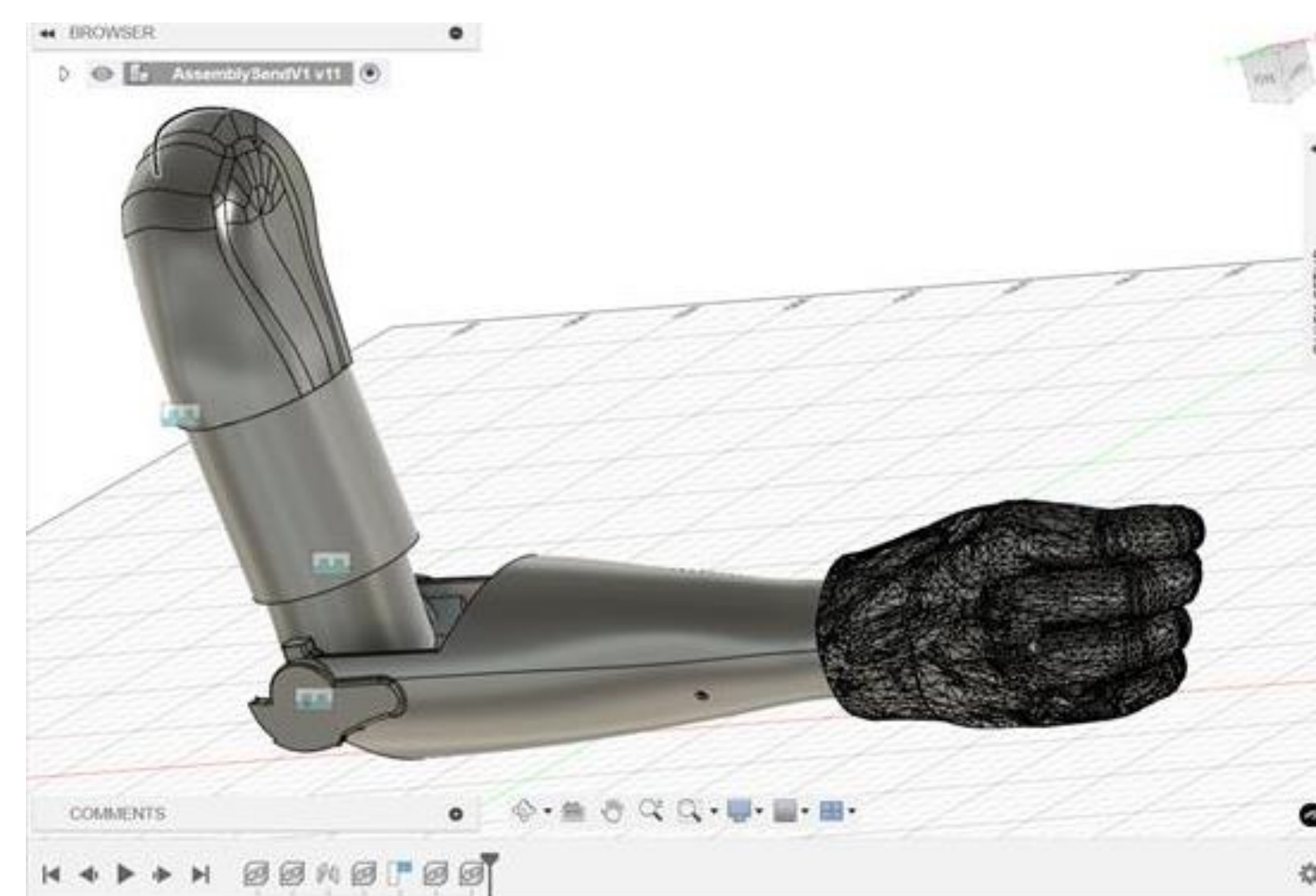


Fig. 1: CAD assembly of the shoulder, forearm and gripper hand prosthetic.

The objective of this project is to design an above-elbow prosthetic to the existing below-elbow prosthetics currently used by BCMF to produce an affordable and functional prosthetic.

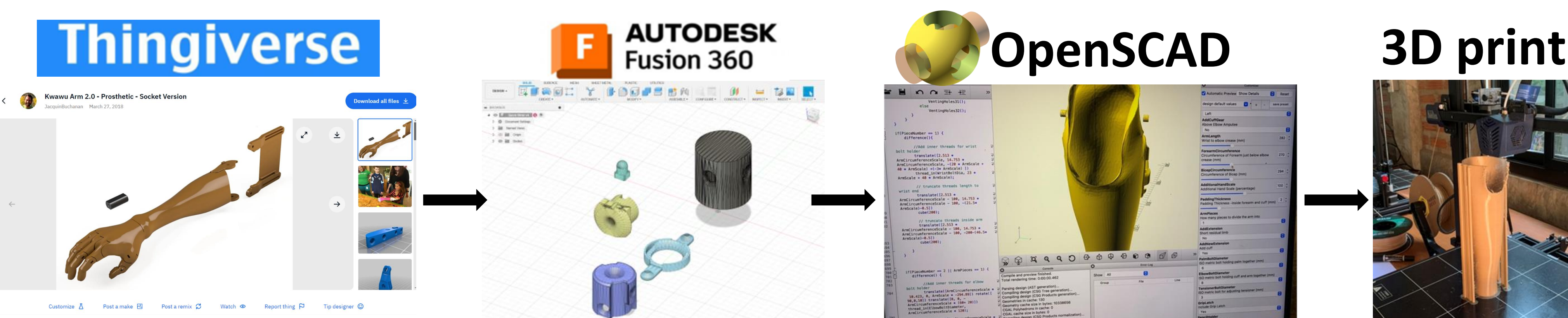
METHODS

QBiT has created this prosthetic while maintaining BCMF's workflow.

Our design:

QBiT has modified the Kwawu Arm 2.0 [2] and designed a shoulder piece to extend the below elbow prosthetic to fit above elbow amputees (fig.1). To fit the recipient's measurements, it is adjusted with OpenSCAD [4], a software for modifying CAD models. A polyester strap forms a harness and is secured with snap buttons so the patient can control the prosthetic by adjusting their shoulder to move the elbow joint and to operate the hand attachment (fig.2). We have added a comprehensive manual, complete with detailed images, outlining the steps for setting up the harness to fit the patient's measurements.

The arm is undergoing an iterative testing process for durability and comfort with constant communication between the BCMF and QBiT. Patient feedback ensures the prosthetics cater to the needs of each recipient.



RESULTS

Since 2019, BCMF has provided 76 3D-printed prosthetics. The new above elbow design improves durability for Burmese climates and living conditions. The prosthetic incorporates interchangeable end-effectors to adapt to the patients' daily activities. The control wires connecting the harness to the dynamic prosthetic are routed internally, minimizing the risk of snagging. The final design restores partial range of motion to the patient through the use of the prosthetic.

CONCLUSIONS

This collaboration demonstrates the potential for future partnerships between educational institutions and NGOs to address health care access disparities and empowers BCMF to expand their reach and improve access to low-cost, body-powered prosthetic solutions for a growing number of patients in need.

Future work includes:

Continuing to fill the gap between open-sourced models and patient-specific needs to refine the 3D-printing workflow by creating customizable, generalized designs.



Fig. 2: Dorsal view of prosthetic harness.

REFERENCES

- UN. *Overview of Myanmar nationals in Thailand*. IOM UN migration. <https://thailand.iom.int/resources/overview-myanmar-nationals-thailand-april-2024>
- Burma Children Medical Fund - Mae Sot, Thailand. BCMF | Burma Children Medical Fund - Mae Sot, Thailand - Operating to give people a future. (n.d.). <https://burmachildren.com/>
- Buchanan, J. (2018, March 27). Kwawu Arm 2.0 - Prosthetic - socket version. Thingiverse. <https://www.thingiverse.com/thing:2841281>
- OpenSCAD. The Programmers Solid 3D CAD Modeller. (n.d.). <https://openscad.org/>