Developing low-cost 3D-printed prosthetics with a functional wrist for patients along the Thai-Myanmar border

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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.

Solution:

- 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.

Challenges:

- Prosthetic options in lower-income countries are often **passive** without complex movements causing limited ability to perform daily tasks.
- BCMF seeks to develop low-cost, functional prosthetics tailored for low-resource settings.
- Open-source designs used by BCMF typically allow for only fixed hand positions, limiting functionality.

Fig. 1: BCMF patient using the QCW with the existing open- sourced 3D-printed prosthetic arm.

The objective of this project is to create a design for an **interchangeable** and **functional prosthetic wrist** that enables critical hand motions such as rotation that ensures functionality and comfort so patients are more likely to use them.

METHODS

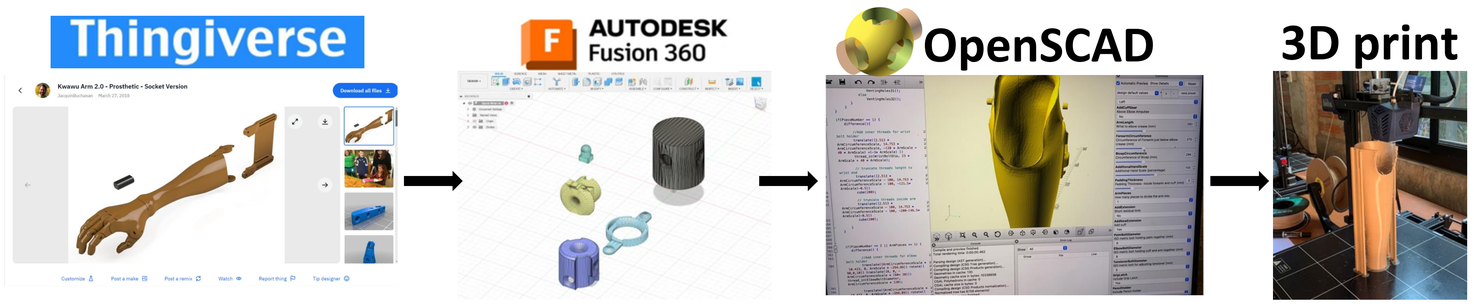
BCMF's Workflow:

- BCMF 3D-prints the Kwawu Arm 2.0 [2] prostheses that is found on Thingiverse, a public library of 3D designs.
- To fit the recipient's measurements, it is adjusted with OpenSCAD [4], a software for modifying CAD models.

Our design:

- The interchangeable wrist model was created using the Quick-Connect Wrist designs found on Thingiverse [3].
- The wrist was merged onto the Kwawu Arm using the 3D design software, Autodesk Fusion 360
- This was printed, assembled, and tested for durability and comfort both with and without patients.

This is an iterative process where patient feedback ensures the prosthetics cater to the diverse needs of the recipients.



RESULTS

Since the launch of the prosthetics project in 2019, BCMF has provided 3D-printed prosthetics to about 80 patients. The interchangeable hand provides a solution to many patients' everyday activities and can rotate the hand 360 degrees (Fig.2) and has been tested on and used by one patient thus far (Fig.1).

Fig. 2: Different hand attachments that are suitable for the arm with a 360 degrees rotation. Left to right: Utensil holder, bicycle attachment, gripper hand (neural and 90 degrees rotation shown).

CONCLUSIONS

The BCMF prosthetics project provides a low-cost solution to **healthcare challenges** in the context of **poly-crisis** experienced in Myanmar.
This collaboration demonstrates the potential for **future partnerships** between educational institutions and NGOs to address health care access disparities.

Future work includes:

- Continuing to fill the gap between open-sourced models and patient-specific needs to refine the 3D-printing workflow by continuing to create customizable, generalized designs.
- We also plan to test the interchangeable wrist with more patients and develop body-powered prosthetic designs to support more critical movements.

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