1. Background
The Victoria Hand Project (VHP) is a not for profit organization based in Victoria, with the mission of providing low-cost, highly functional, 3D printed, upper-limb prosthetic devices to the developing world. VHP uses 3D printing and 3D scanning to create custom prosthetic devices for amputees who would not have access otherwise. The hands are highly functional but they are still limited in the tasks they allow the user to carry out. For amputees, everyday tasks such as eating, cooking, dressing, and washing become challenging to complete. Multiple users of the Victoria Hand have asked for additional terminal devices that can assist them in carrying out their day-to-day tasks. For example, a local user asked for a knife holder to make it easier to cut their food.

2. Project Proposal
The proposed project is to design terminal devices that an amputee can use in place of the Victoria Hand. The user would be able to remove the Victoria Hand from the wrist unit and replace it with a different terminal device. These terminal devices would make repetitive, day-to-day tasks easier for the user. Although the Victoria Hand is able to help amputees with many tasks, it cannot always help with all of the tasks the user wants to complete in their day-to-day life.

The main devices that VHP is hoping to deploy includes a utensil holder and a device to grip the handlebars of a bike. The utensil holder would be a 3D printed device that can attach to the wrist, and will hold a utensil to assist in eating. For bilateral, upper-limb amputees (missing both hands) using utensils for eating can be extremely difficult, and many find it debilitating to ask a friend or family member for assistance. Even for amputees only missing one hand, the device will be useful, as they cannot easily use two utensils at once (i.e. knife and fork). The utensil holder would allow the user to hold a fork, a spoon, or a knife, to assist in eating, but would also allow for easy removal of the utensil for washing.

Riding a bike is the main mode of transportation for many people in the developing world. This can be a pedal bicycle or a motorbike. One of the first questions that amputees ask when they are being fit with a Victoria Hand is if they can use it to ride a bike. The Victoria Hand was not designed to be used for riding a bike, but now the VHP team is beginning to understand the need for a device that will allow users to safely ride a bike. This device would grip the handlebars to allow the user to safely control their bike when they are riding. The device would need to be strong enough so it would not break as the user rides the bike. A quick-release mechanism is also ideal to reduce the chance of injury in the event of an accident.

The Victoria Hand is attached to the Forearm Socket using the “Wrist Ball”, which is shown in Figure 1. The Wrist Ball is part of the ball-and-socket wrist, which allows the user to orient the wrist in any position they require. It is grooved so that the rubber inside the wrist socket can help lock the hand in place when the wrist socket is closed. The proposed terminal devices would be designed using the Wrist Ball, so that the user is still able to orient the terminal device and “lock” it in place.
3. Final Product

The outputs of the proposed project would be SolidWorks/STL files of the terminal device that can be 3D printed by VHP. These designs could be 3D printed in VHP’s international clinics, and provided to amputees as an option for an additional terminal device. VHP will provide the 3D printers, the 3D print materials, and the design of the Wrist Ball to the team members for designing. Members of VHP will also consult the Hackathon team on their design by applying their knowledge of 3D design, 3D printing, and the Victoria Hand. VHP can also run a design meeting with the Hackathon team to go over the design requirements and expectations.

VHP is open to other concepts for terminal devices that the Hackathon team sees as useful to amputees in the developing world.

4. Contact

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