

Lending a Helping Hand

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Introduction

In this day and age, the international community is constantly achieving technological and scientific progress. New technologies continuously become available and are integrated into everyday life. They are used in innovative ways to improve everything from daily tasks to medical treatment. However, when it comes to the access and use of curative technology, a discrepancy still exists between the developed and developing world. In any effort to address global poverty issues, incorporating these advances could offer a more efficient, sustainable, and cost-effective approach. It is with this mentality that we seek to increase access to affordable prosthetics in Central America, beginning in Ahuachapán, El Salvador.

There is a growing demand for prosthetics around the world and specifically in El Salvador and Central America. Chronic disease, natural disasters, and accidents contribute to this demand, especially in the densely populated capital, San Salvador. The loss of a limb often results in the inability to work and therefore the inability to support oneself. Consequently, many amputees live in poverty throughout this region. There are prosthetic limbs available that could make a difference, but these are expensive and difficult to replace after normal wear.

We plan to provide cost effective and easy to maintain prosthetics using 3D printing technology. This technology is continuously becoming more accessible and more affordable. It allows the user to create objects from a variety of materials, including the durable plastic ABS. Currently, there are several open source models available for prosthetic limbs that can be printed by any owner of a 3D printer. We will begin our project by producing the Robohand model using a Makerbot Replicator 2X printer to provide increased dexterity for hand amputees. This model can be produced for ¼ the price of current prosthetic arms available.

Partnerships

In Ahuachapán, we will be working with the Salvadoran Mission Projects (SMP), an organization that coordinates development initiatives throughout the country to improve the lives of the economically disadvantaged. Darby Shuler has worked with SMP every summer for the past four years, getting to know the director, the staff, and the volunteers. She has helped organize past projects, including home construction, public health initiatives, and medical clinics. Additionally, we will be collaborating with SMP's Clinic in Ahuachapán, the Methodist Medical Clinic. Through the clinic, we will work with local doctors, nurses, and two prosthetic experts who will help us adjust the prosthetic limbs to patients. This organization has connections with communities throughout El Salvador, as well as neighboring Guatemala. While we will be based in Ahuachapán, we will reach patients across the country and region.

Why Robohand?

We will begin our project by producing the Robohand model because this is an easily accessible and easily constructible model. The open source file is accompanied by specific instructions for assembly and has been successfully implemented in South Africa, the United States, and Australia. We are confident that with careful consultation with the Robohand USA clinic, the Integrative and Qualitative Center (IQ) at Washington and Lee University, and the prosthetic experts in El Salvador, we will be able to produce a safe, useful, and durable prosthetic arm. Other models are currently being developed and

are becoming available. Once the Robohand is successfully provided, SMP can later produce other types and models of prosthetic limbs using the same equipment.

Plan

Pre-arrival (now until June): Upon receiving the grant, we will purchase the printer to be brought with us. For the past year, we have been collaborating with our university's IQ center to operate the Makerbot Replicator 2X printer and practice making Robohands. We will also collaborate with the Robohand USA clinic, which has begun supplying Robohands in Atlanta. In El Salvador, SMP will be identifying potential recipients and working with local volunteers to develop a mode of distribution.

Setup (early June): During the first few weeks, we will be setting up the printer at SMP's local facility and working with the prosthetic experts to perfect our production of the Robohand model. We will also meet with community leaders and potential recipients, taking measurements and strengthening relationships with community members.

Execution (late June through August): Throughout the summer we will be providing and fitting hands to the aforementioned recipients and working with communities across El Salvador.

Follow-up: Afterwards, we will assess the successes/failures of the project, establish future protective and maintenance measures for the printer, and consider possible expansion (other areas of El Salvador; future collaboration with organizations in Guatemala, Nicaragua, Costa Rica, Ecuador).

Applicants Role and Expertise

Both Darby Shuler and Manuel Garcia are fluent in Spanish and have had combined work experience in countries in public health and clinical work across Latin America, including Costa Rica, Ecuador, El Salvador, Mexico, and the Dominican Republic. Darby Shuler has been working for the past semester at the Washington and Lee's new Integrative Quantitative (IQ) Center, where she has worked directly with a Makerbot Replicator 2X 3D printer. She has learned about the programming for the printer and has successfully printed and assembled a model hand.

Sustainability

Our method of sustainability consists of three factors: a progressive price index, a microfinance model of distribution, and a funding campaign that links charities and governmental institutions to our initiative. Upon the production of a hand, we would work with our collaborators to determine the capability of payment per patient to determine an appropriate price for the individual. Additionally, since the Mission Projects would have a longer relationship with the patient, that would facilitate our assessment in determining the proper plan of payment. Evidently, for those who have been unemployed as a result of their condition, the hand would be released to them on an incremental plan of payments, incorporating the necessary oversight of our collaborators who will make sure to maintain a steady relationship with potential employers and individuals in need. The goal of this is to compensate for the cost of the materials and production of the hand in order to assist more individuals in the future. The organization will not be making a profit from the Robohand production. Finally, we hope to take this project to bigger levels. Upon completion of our time in El Salvador, we will organize a plausible funding campaign, which will include presenting our results to the Salvadoran department of health, outlining the efficacy of our program, and advocating for further funding to local and international charities. Based on our successes, we hope to use them as a potential platform of expansion within Central America.