[Robot Arm White Paper]

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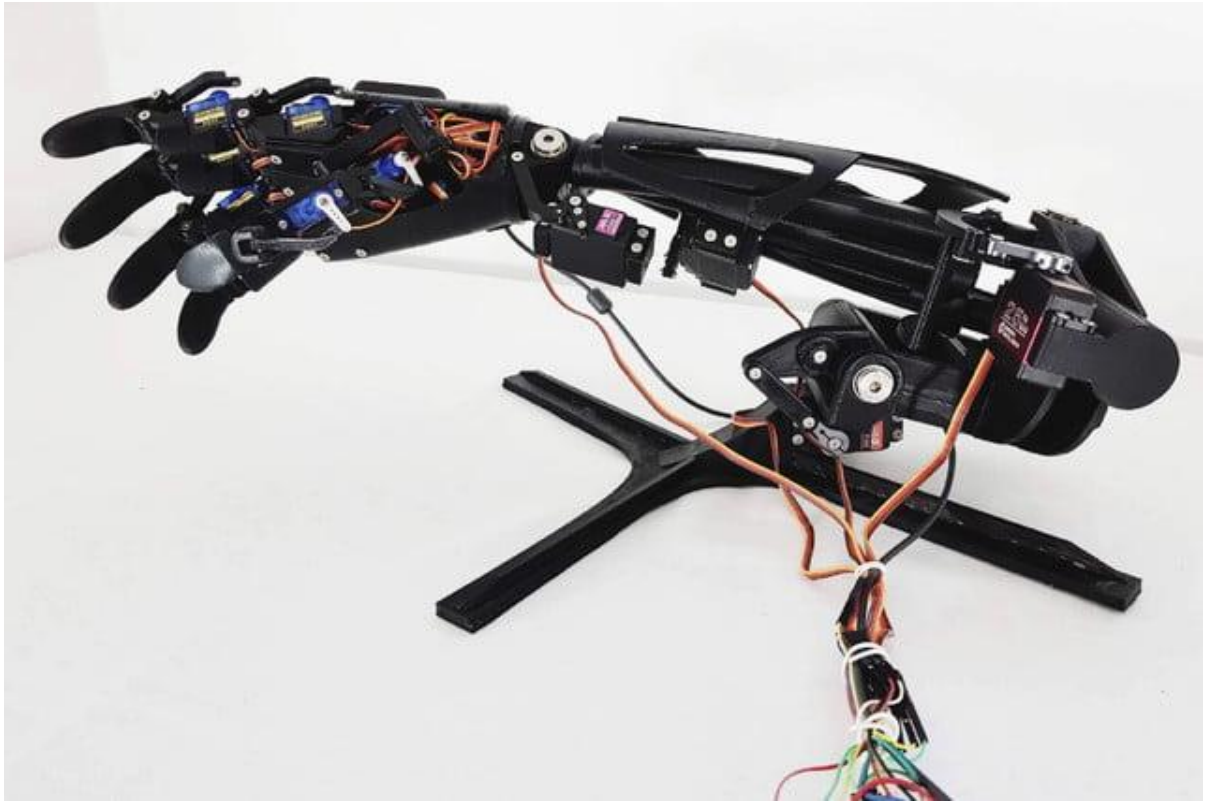

Abstract:

Summary of white Paper

Introduction

The interaction between man and machine has played a major role in modern human societies. Many people in the world today struggle with the loss of limb and loss of life due to accidents and dangerous situations. Whether the accident hasn't happened yet or has long since occurred, the solution is similar. Robotic limbs can be used to assist those in such situations.

The Problem

Our project is a human-sized robotic limb that mimics the movements of the User's own hand. The concept behind our project applies to numerous fields and industries. One of the uses for this type of technology is to utilize it to help alleviate some of the burdens that come along with handicaps. Our project utilized small and somewhat fragile components due to cost restrictions however a slight tweak in components could make this extremely useful. For example, if we exchanged the plastic materials we used with something more durable such as metal and exchanged the small motors for higher grade motors you could potentially have an arm whose grip strength would far surpass anything a human would be able to replicate. Taking it a step further, if we were to upscale the size of the components and use industrial-grade motors we would be able to hold and lift things that would normally take heavy machinery to lift and handle with the precision of our fingers.

Despite the many uses, we believe the most important application of this technology to be the possibility of fully functioning prosthetic arms. Vaguely similar to

our bodies, the arm's movement is reliant on the amount of electrical current passing through it. Similar methods have been used in products that are already readily available in the prosthetic market. INSERT ARM PRODUCT HERE. However most of these products don't offer the full range of motion demonstrated in our project, they usually only have an open/close mechanism that mimics a hook. There's no doubt that this technology will continue to be developed and eventually be used for various applications.

The Design

The creation of our arm was pretty straightforward and inexpensive. The plastic models were created and rendered on 3D software which is open source. We then took those files and printed them using a small 3D printer. Standard M3 bolts of varying sizes then hold the pieces in place. We used MG90S motors along with 10k OHM potentiometers to capture and replicate the movement of the user's hand. When the user's hand is at rest the potentiometers are turned off and the bionic hand stays in place. When the user moves their hand the potentiometers allow the bionic hand to replicate the movements. To connect everything we used standard copper wires which we soldered to the ports of the potentiometers. We originally used clip-on wires but found that they were very unstable and popped off easily, so we decided to buy a soldering machine and solder the cables. Finally, we utilized 6 Arduino nano's that are each loaded with the required code for their respective arm segment. We decided to use nano's to save on space, also because of this we decided to use mini breadboards as well. . Since each segment of the arm requires its code, if we used full-sized arduino's it would take a large amount of space. With arduino nano's, everything was

able to fit on a small panel attached to the arm. The code required is very simple as you only need to indicate what the motors will do at various power segments. The components needed for this project were readily available and inexpensive to find especially if you already had some leftover hardware from past projects. The only adjustments needed to change the functionality of the arm to suit various industries would be to adjust the scale of the components.

How It Solves The Problem

Our bionic arm can fulfill the needs of various industries. We vaguely touched on it before but the main purpose of our human-sized hand would serve as a substitute to our own hands. The reason behind this would be up to the user. It could help fulfill the daily tasks of someone with a handicap. Another use case would be as a substitute for handling dangerous equipment. For example, handling dangerous chemicals in a lab, the user could station the arm a safe distance away from themselves. Not only would this help with safety protocol but it would also allow the user to control the hand with very accurate precision, which may be needed in a lab setting. By adjusting the scale of our arm it opens up the possibility for use in various other industries. For example, an enlarged version of the arm could serve the industrial industry quite well. Forklifts have usually been the go-to device in this industry because of the flexibility it offers in the work environment. INSERT ARTICLE ABOUT FORKLIFTS However our arm would provide much more flexibility and functionality than a regular forklift because it would be able to move items much more accurately.


Conclusion

In conclusion we decided to build this project because we know how useful this type of technology can be. This technology has the capability to bless the lives of people in many areas including prosthetics, construction, and handling in dangerous situations. We used the best technology and materials available to us, but depending on the specific usage, can be improved for a particular application. This project has not only been exceedingly helpful for us, but could potentially help many other people and is an incredible piece of technology now available to the world.

Citations

“3D Print the New Youbionic Human Arm at Home or through a Service - 3dprint.Com: The Voice of 3D Printing / Additive Manufacturing.” 3DPrint.Com | The Voice of 3D

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