

Deliverable J: User Manual

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Abstract

User Manual for One Step

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This user manual deconstructs the our design making process and explores every aspect of product development. It showcases the features and capabilities of our product and informs the users about the components that were used to create the final product. It also introduces why the product is launched and for what reason it is required in the market. The manual also includes how to use the device and the general setup that is used to activate it. The manual also instructs the user on how to maintain the device and provides a health and safety guideline to ensure the product's functionality is maintained. Due to the COVID-19 pandemic, we weren't able to create the full fledged product but we still manage to make it functional. While its functionality may not be perfect, there are some guidelines for troubleshooting the product by configuring some of the settings that can be done manually or by calling our support team. All the work files and design process are available in the maker repo website which is also mentioned in this manual in case the user is curious about our work. This product is made to bring change to the society and we certainly hope it does so.

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Introduction

Freezing gait is a condition caused by Parkinson's Disease. It occurs because Parkinson's interrupts your brain's ability to send signals to the limbs, causing someone affected by Parkinson's to stop in place and be unable to move, as if they were frozen. While this can be manageable with the help of another person or a caretaker, if someone experiences freezing while they are alone or when there isn't anyone able to assist them, the situation can quickly become dangerous. Without someone's aid, the Parkinson's patient could become stuck, essentially becoming trapped, unable to move from where they stand. This causes interruptions to the person's day, and at worse, could lead to injuries. Freezing gait is one of the most problematic effects of Parkinson's, and as Parkinson's has no cure, finding a way to mitigate the effects of freezing gait is incredibly important.

When developing a solution, some basic requirements must be met. First and foremost, the solution must be able to help a Parkinson's patient overcome freezing gait efficiently. Next, the device must be easy and intuitive to use so that the user would not have any additional difficulties. The device also needs to be small and hidden, as wearing a large and bulky device would be uncomfortable and embarrassing. Finally, the device needs to be inexpensive and durable, so that those who need it can purchase it and don't have to worry about it falling apart.

One Step is designed to fit all of these needs. With its small design, it can easily fit into a user's shoe, and provide them with the ability to overcome freezing gait without the aid of another person. One Step uses a simple phone app to allow the user to easily activate the device with the press of a button. Once the button on the app is pressed, the app sends a Bluetooth signal to the insoles, instructing them to vibrate in a way that mimics a person's walking rhythm. This goal of this mimicry is to trick the brain into thinking the user is already walking and allow them to overcome freezing gait and continue their day, reassured in the knowledge that they can be self-sufficient and not worry about becoming stuck in a dangerous situation. While there may be some existing solutions for freezing gait such as laser attachments for canes, One Step is lightweight and does not require the user to carry around any additional equipment, making it the perfect solution for individuals who suffer from freezing gait.

Features and Capabilities

The main features of the device are its vibrating motors in the insole and Bluetooth capability. The motors are powerful enough to be felt through a shoe but not harm the user. The Bluetooth feature allows for the device to be triggered remotely with little effort and does not require much knowledge of technology. The device is capable of randomly selecting between 5 vibration patterns so the client does not become accustomed to the pattern. It is also possible to change each of the vibration patterns by simple adjustment of the code executed by the device.

Prototype Construction

Materials Required

Product	Unit Cost	Quantity	Total Cost	Link
ESP-32 Dev Board	\$11.00	2	\$22.00	Here
Vibrating Motor	\$0.67	6	\$4.02	Here
Wire	\$0.10	16	\$1.60	Here
Transistor	\$0.07	2	\$0.14	Here
Panasonic CR2477	\$1.40	TBD	TBD	Here
Insole	\$7.50	2	\$15.00	Here
		Total Cost Per Set of Devices:	\$42.76 + Cost of Batteries	

**All components are sold in bulk, therefore, the cost of building only 1 device is greater.*

Equipment Required:

3D printer

Soldering Iron

Computer

Micro-USB to USB Cable

Building:

1. Download the files named “Reciver_Code” and “Sender_Code” from [Makerepo](#).
2. Designate 1 of the ESP-32 Dev Boards to be the sender and the other to be a receiver.
3. Upload the code named “Sender_Code” to the sender board using the Arduino IDE.
**If this is your first time using an ESP32- Dev Module the [drivers](#) and libraries [1](#) and [2](#) will need to be installed*
4. Upload the code named “Receiver_Code” to the receiver board.
5. Connect the wires, transistors, batteries, vibrating motors and ESP-32 Dev Boards as seen in Appendix A: Wire Diagram using the soldering iron.
** The batteries were not tested in the final prototype, therefore, their wiring may need to be adjusted.*

The following steps were able to be completed due to COVID-19 and may need to be adjusted as seen fit.

6. 3D print a case that will be able to house the batteries and will provide access to the batteries in the event that battery replacement is necessary.
7. Cut sections into the bottom of both insoles to fit the assembled devices and battery housing (One device per insole).
8. Place each device into its respective shoe and ensure each device is secured. The sender should be placed in the right insole and the receiver should be placed in the left insole.

Using the Device

General Setup

1. Ensure the device is turned on. This can be seen by the presence of a red light illuminating from the device (The black microcontroller).
2. Open your smartphone Bluetooth settings and ensure Bluetooth is turned on.
Settings App -> Bluetooth -> Bluetooth On

Connecting to a Smartphone using Bluetooth:

1. Download the Blynk Application from the App Store (iPhone) or the Google Play Store (Android)
2. Open the Blynk App
3. Open the QR code scanner function of Blynk (Top Right Hand Corner)
4. Scan the QR code seen to the right. You should now see a project called “Insole”. If this does not work please contact our support team.
5. Tap the Bluetooth icon seen in the middle of the screen and select “Connect BLE Device”
6. From the list of devices select “Irene’s Right Insole” and select Ok in the top right corner.
7. Ensure the device is connected. This can be seen as the Bluetooth logo seen on the Bluetooth icon should have turned from grey to blue.
8. Tap the play button seen in the top right corner.
9. The device should now be fully connected to your phone and now your phone should automatically connect to the device when turned on.



Activating the Device

1. Open the Blynk App and ensure the Bluetooth icon is still blue.

* If not blue please return to step 5 of connecting to a Smartphone section.

2. Click the large button labelled V5.

Maintenance

1. Replace the batteries whenever necessary
 - a. Take each insole out of your shoe
 - b. Remove the batteries from the case and replace in the same order/ orientation
 - c. Place the insoles back into your shoes
2. Periodically inspect the insoles for wear and ensure all components are connected and functioning properly

Health and safety guidelines

1. Do not try and increase the power of the motors and it may cause them to overheat or cause damage to the foot.
2. Do not ingest or swallow any parts of the device.
3. This product can support a maximum weight of 160kg, failure to observe this may result in failure of the device and may cause serious damage to the sole of the foot.
4. Do not throw the device.
5. Do not submerge the device in water when turned on as it will cause damage to the device

Troubleshooting

Common Issues:

Bluetooth Disconnecting:

- Ensure your phone's Bluetooth is on by going to your Bluetooth settings in your phone's settings application and ensuring the button is turned on.
- Ensure you are within range of the insoles. The range of the device is approximately 200m.
- Ensure the device is turned on and batteries are not depleted.
- If you have tried all the above and the device still will not connect try removing the batteries on both devices and then put them back in. This will reset each device.
- If the device still will not connect please contact the support team.

The Right Insole Works But Not The Left

- Check that the left insole is on and the batteries are not depleted.
- If possible ensure all wires are connected.
- If you have inspected the device and it is on and all wires are connected but the device still does not function, remove and reinsert the batteries to reset the device.
- If the device still does not function there is a software issue. Please contact the support team.

The Left Insole Works But Not The Right.

- This issue is almost exclusively a wiring issue.
- Ensure all wires are connected on the right insole
- If all wires are connected and the device still does not function contact the support team as there is a software issue.

Design Files

ALL CAN BE DOWNLOADED OFF [MAKEREPO](#)

Deliverable A - Client Meeting Preparation

Deliverable B - Needs, Problem statement, Benchmarking, Metrics and Target Specifications

Deliverable C - Conceptual Design, Project Plan, Feasibility Study

Deliverable D - Detailed Design, Prototype 1, and BOM

Deliverable E - Project Progress Presentation

Deliverable F - Business Model

Deliverable G - Prototype 2

Deliverable H - Economics Report & 1-minute video pitch

Deliverable I - COVID-19 Project Update

Deliverable J - User Manual

Deliverable K - Final Presentation

Deliverable L - Intellectual Property Search

Sender_Code - Code to be uploaded to the sender ESP 32 Board

Receiver_Code - Code to be uploaded to the receiver ESP 32 Board

Parkinson's_VideoPitch - Video explaining the device

Conclusion and Recommendations

Throughout this entire process of product developing, we learned that consistent meetings help us organize our work and also build focus so that everyone knows what needs to be done. Another key point is communication, since communicating with each and every member in a group is necessary to inform/announce any progress or work that needs to be announced. Sometimes not everyone can attend the group meetings due to some circumstances and because of that we have a group chat where we can openly communicate with one another. Even though the COVID-19 pandemic restricts us from meeting, we still plan and get our work done collectively without any issue. For future improvements we may consider for everyone to actively take part in our work and make that compulsory so that all the work is distributed evenly otherwise, we have efficiently carried out our work.

Support

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Appendix A: Wire Diagram

