

GNG 2101

Introduction to Product Development and Management for Engineers and Computer Scientists

**Project Deliverable J: User Manual**

Lab Section: A02, Wednesday, Lab Group A7

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**Abstract**

Everyday tasks such as pressing buttons (automatic door buttons, elevator buttons, crosswalk buttons etc.) in a public manner may seem just as easy as pressing the button to your average person, but for blind persons this can be extremely difficult. Another added element to this problem is now that we have the Covid-19 virus so prevalent in everyday life, one would not want to be feeling around a high traffic location with their hands in fear of contracting the virus. Our product is a device that uses a software app to detect these buttons and uses sounds to alert the user of the button, a button is then pressed which extends a rod 1 meter to press the button so you will have no worry of contracting the virus. This manual outlines the design process of our product.

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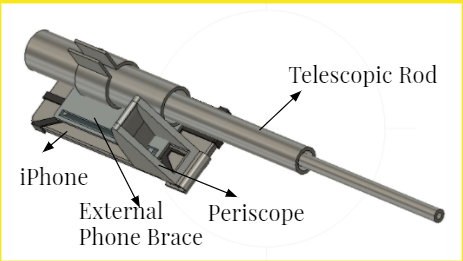
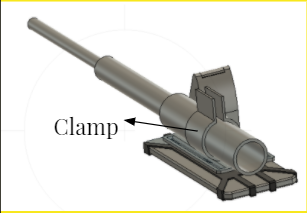
# **1.0 Introduction**

Covid-19 presented a whole new challenge for people who are visually impaired and still have to go out into public regularly. We created a solution that uses an application called Seeing AI to detect accessible buttons and notify the user so the user can press a button on an extendable rod that is connected to their phone, which extends the rod so the accessible button can be pushed with the rod which prevents any risk of contracting the virus. A phone's ordinary camera does not have a very large field of view, so a periscope is placed over the camera on the phone which allows for a much higher field of view. Our product was designed for very safe and easy use so anyone can use it with ease. Our product was also designed to be affordable yet still durable.

# **2.1 Important Features of NearSight 100**

NearSight 100 is a device that makes use of a software app Seeing AI and mechanical components such as a portable and detachable external phone brace, a telescopic rod and a periscope. The Seeing AI app scans and detects for automatic accessible buttons such as handicapped push buttons, elevator buttons and traffic light buttons. At the press of a button, the telescopic rod extends upto a range of 1m and collapses when activation is necessary. A periscope allows for visual accessibility for the camera lens of the phone and aids in scanning for objects that are located at a 90 degree angle from the orientation of the phone. A wrist loop acts as a safety mechanism that prevents an accidental slippage from the user’s hands.

# **2.2 Functions and Capabilities of NearSight 100**

A periscope is an optical instrument that uses a system of mirrors to reflect images that are above the line of sight. The phone is then latched on to the external phone brace as seen in figure 1. 

**Figure 1**. 3D Assembly of Our Prototype

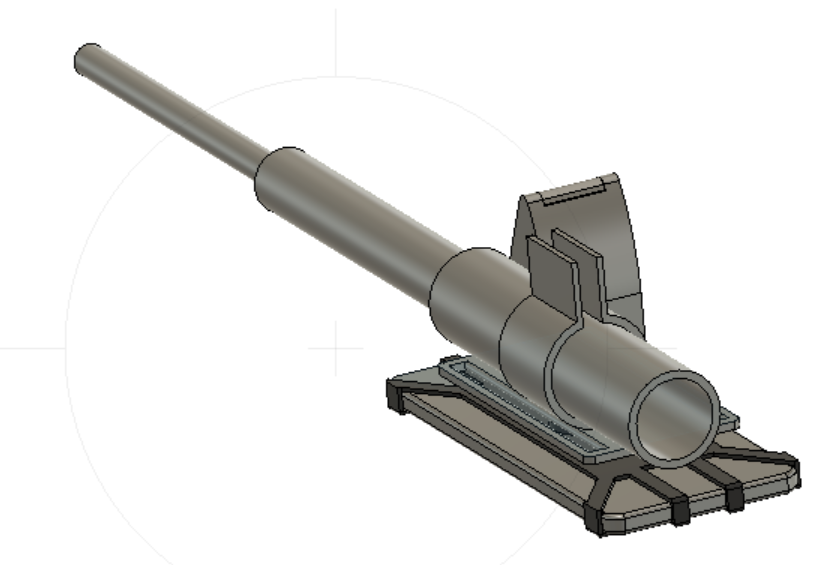
A clamp and bolts are used to secure the telescopic rod on the external phone brace away from the phone’s camera. The periscope is attached on top of the camera ensuring that the surfaces are flush and allows an accessibility range of 75 degrees. The periscope now allows the camera lens and the telescopic rod to be within their same line of sight. The phone should also have the Seeing AI app installed to further scan and detect the automatic buttons in the user’s vicinity. The Seeing AI app works to read text in real time which is useful because usually there is text on these buttons or alternatively you can take a picture of the scene which gives helpful details about the environment. Once the Seeing AI app locates the and captures the button in its range, it alerts the user blatantly or through a subtle notification to stop scanning and lock in the position of the button. The user can activate the extension of the telescopic rod by pressing a button on the rod and successfully push the automatic accessible buttons.

# **2.3 How the prototype was made**

** Figure 2.** Depiction of the External Phone Brace

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**Figure 3.** Depiction of Our Final Product

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**Figure 4.** 3D CAD Model of Our Prototype

# **3.1 Installation Instructions**

The procedure to install the NearSight 100 is fairly simple and includes the following steps:

1. Take your phone and place it in the elastic bands in the top corners of the external phone brace
2. Make sure all the phone is secure
3. Gently slide the periscope into place at the top right corner, where the phone’s rear camera is located
4. Make sure the periscope is aligned with the phone’s rear camera
5. The external phone case is securely attached to a clamp
6. Attach the clamp to the telescopic rod and adjust accordingly to your satisfaction
7. The NearSight 100 is fully assembled and ready for use

# **3.2 Operation Instructions**

The procedure on how to operate NearSight 100 is as follows:

1. Extend the telescopic rod to your desired length
2. Twist and lock the telescopic rod into place
3. Open the Seeing AI app and have it readily available on your phone
4. Use the telescopic rod to navigate around and identify the exact position of the button you want to identify
5. Once position is detected, point the telescopic rod in the direction of the button you want to identify
6. In an audio cue the Seeing AI app will describe the button in front of you
7. Once identified, press the button with the telescopic rod
8. Collapse the telescopic rod and let it hang loose on your arm with the attached wrist sling, or it can be put away in your bag until needed again

A Video outlining the assembly and operation of NearSight 100 can be found through this link on youtube:

<https://www.youtube.com/watch?v=nMtMeO1U8ic>

# **3.3 Maintenance instructions**

To maintain the form of NearSight 100 the following guidelines should be followed:

1. Test the telescopic rod if it can extend and collapse easily if not in use for a long period of time
2. Make sure to detach the telescopic rod and external phone brace after every use
3. Store the telescopic rod in its fully collapsed position in a separate container
4. Store the external phone brace in a separate container
5. If any parts are broken notify the company immediately

# **3.4 Health and Safety**

Although NearSight 100 was produced with many prototypes and testing, there are some health and safety guidelines that should be taken into consideration while in use. Firstly, the device does not fully guarantee that every accessible button will be found. This is particularly because the SeeingAI app and other apps are limited in what they can identify since it’s dependent on what they have already identified and the quality of the camera. So when the device is in use there must be an awareness of this, and users should take caution when they are approaching what could be a button. Additionally, due to the fact that users are most likely handicapped, users must ensure that their phone is properly fastened to the device, as many other problems could come from omitting this. This primarily means that the instructions are carefully followed, so the phone case must be removed and the phone is properly placed inside before using. Finally, users must ensure that they use the wrist strap. This is crucial since the weight of the phone can vary, and while holding the device in one hand, the weight could become too much to hold which could result in dropping the device. This could result in damage to the device and the user’s phone, which could be avoided if the wrist strap is used.

# **3.5 Troubleshooting and Operation**

1. Ensure the model of iPhone is 5th - 10th generation for basic compatibility and for best performance iPhone 6th-8th generation.
2. Remove case from the iphone to allow for the periscope to be fish with the iPhone rear camera.
3. With the case removed slide the iphone into the rubberized arm brace make sure that all edges of the phone are secured by the rubbers and that each edge is pulled tightly across the phone removing all slack.
4. With the phone secured align the periscope with the rear camera slide it onto the phone until the periscope is stuck on the protruding rear camera and wont fall off in either direction (vertically or horizontally) if it is easily sliding off the phone when applying downward pressure to the periscope, pull the rubber straps on the top end of the phone down as far as possible and try again, there’s no need to do the same on the bottom. Alternatively feel for the camera with your finger and then attempt the procedure again making sure that the periscope is not angled and follows the direction of the iphone pointing directly away from the user.
5. Another important aspect is to make sure that the flange of the periscope slides underneath the rubber strap and does not slide over top of the rubber strap. The flange must be flush with the iphone on the back side and flush on the screen side, underneath the rubber on the screen side of the phone.
6. To extend the rod, twist clockwise in order to change the length and then twist the rod counter clockwise when the desired length is reached in order to lock the rod to its desired length. The procedure is the same to collapse the rod shortening it.
7. Open the Seeing Ai app or any alternative that you may wish to use with the iphones accessibility support activated, for seeing Ai navigate to scene or text to speech mode in order to begin using the apps assisting features. Pointing in the direction with which you need assistance.

# **4.0 Conclusions and Recommendations for Future work**

Throughout the entirety of the project the iterative engineering design process was taken into consideration. At each point in the design process we made sure to analyze whether or not we were solving the right problem and then bench mark and research when we needed to discover a more specific solution for our client. For each design and solution the persistence loops were applied in order to ensure that the prototype being developed would work as intended and be the best possible solution that we could generate given our constraints. With the prototype we also learned what materials would work well together to provide us with the most efficient, lightweight prototype. For future work, students with software or coding experience are welcomed to further develop the Seeing AI app with the appropriate legal permissions, to then add extra buttons that the app can identify. Also producing a seperate app that is feasible for both android and iPhones working alongside the telescopic rod is encouraged as well.

# **5.0 Bibliography**

**[1]**<https://www.amazon.ca/TEUMI-Rotatable-Compatible-Universal-Adjustable/dp/B07WD32J51/ref=sr_1_7?crid=1G13EKK14NC56&dchild=1&keywords=phone+arm+strap&qid=1602197192&sprefix=phone+arm+%2Caps%2C259&sr=8-7>

# **Appendix**

# Table 1. Bill of Materials

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Item number | Part Name | Description | Quantity | Unit cost | Extended cost | Web Links |
| 1 | Hose clamp | 1-¾” hose clamp with worm gear tightening | 2 | $1.18 | $2.36 | Home depot price  Alternate link to amazon  <https://www.amazon.ca/Breeze-Power-Seal-Stainless-Worm-Drive-Bandwidth/dp/B008MG2BM4/ref=sr_1_9?dchild=1&keywords=hose+clamp+1-3%2F4&qid=1607909779&sr=8-9> |
| 2 | Telescopic Rod | Rod dimensions roughly 150mm x 63mm x 10 mm | 1 | $24.95 | $24.95 | <https://www.amazon.ca/SZABTO-Adjustable-Extension-Telescopic-Mirrorless/dp/B07XBSX3N9/ref=pd_rhf_sc_p_img_3?_encoding=UTF8&psc=1&refRID=TFXDMRR0VEG2SV2FRHQY> |
| 3 | ¼”x¾” Hex bolt grade 5 | Hex bolt ¼” threads ¾” bolt head  In store purchase | 1 | $0.1 | $0.1 | Home depot pricing  Website price varys  <https://bcfasteners.com/shop/hex-bolt-grade-5-zinc-14-20-nc/> |
| 4 | Phone support | Silicon adjustable armband. 360 degree rotation, easy access, secure. | 1 | $15.8 | $15.8 | <https://www.amazon.ca/TEUMI-Rotatable-Compatible-Universal-Adjustable/dp/B07WD32J51/ref=sr_1_7?crid=1G13EKK14NC56&dchild=1&keywords=phone+arm+strap&qid=1602197192&sprefix=phone+arm+%2Caps%2C259&sr=8-7> |
| 5 | Cable Ties | 15” cable ties blk 6 pk  In store purchase | 1 | $0.42 | $2.24 | Home depot price  Alternative amazon link  Price varies from instore price  <https://www.amazon.ca/SecuriTie-CT14-50100UVB-Management-Industrial-Household/dp/B06Y4MSKCV/ref=sr_1_5?dchild=1&keywords=15+inch+cable+ties&qid=1607909814&sr=8-5> |
| 6 | ¼” finish hex nut grade 5 zinc | Hex nut zinc plated  In store purchase | 1 | $0.05 | $0.05 | In store price  Website price differs  <https://www.homedepot.ca/product/paulin-1-4-inch-20-finished-hex-nut-zinc-plated-grade-5-unc/1000123233> |
| 7 | ¾” finish hex nut grade 5 zinc | Hex nut zinc plated  In store purchase | 1 | $0.08 | $0.08 | In store price may vary from website price  https://www.homedepot.ca/product/paulin-3-4-inch-10-finished-hex-nut-zinc-plated-grade-5-unc/1000123787 |
| 8 | Periscope | Mirror to change the incident angle of light with respect to the camera | 1 | $9.90 | $9.90 | <https://www.amazon.ca/gp/product/B07772WZTX/ref=ppx_yo_dt_b_asin_title_o03_s00?ie=UTF8&psc=1> |
| Total cost |  |  |  |  | $55.48 |  |