

GNG 2101

Introduction to Product Development and Management for Engineers and Computer Scientists

**Project Deliverable G: Prototype 2**

Lab Section: A02, Wednesday, Lab Group A7

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**Introduction**

The following deliverable elaborates further on the groups project plan and the first prototype to further develop the project's feasibility. The deliverable contains the client's feedback that is broken down and evaluated. This deliverable illustrates the groups design ideations through from a medium fidelity prototype that pushes closer to a high fidelity final product. Also the second prototype is explained where images of the prototype and its functionality are annotated to better understand the concept. Additionally the target specifications and the actual values are compared and analyzed for the deliverable.

**Client III Meeting Feedback**

The client was presented with the design proposal where an arm brace was designed to support a smartphone on the supinator arm where the Seeing AI app is supposed to be downloaded to carry out the scanning and detection processes. On the pronator arm, initially a detachable telescopic rod with an endoscopic camera embedded within was proposed to extend and actuate the accessible automatic buttons. The client claimed that the orientation of the telescopic rod located on the supinator arm would not provide effective mobility compared to the telescopic rod being held in the palm to scan the surroundings. It was then discussed that a wrist loop could be used to safely tether the telescopic rod and the client could hold the rod in her palm to point and scan for the automatic buttons. When the telescopic rod is not in use, a sleeve in the arm brace could be

designed for storage purposes.

**Prototype II**

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| In Figure 1 we see the prototype 2 being tested for compatibility with commonly encountered automatic buttons. The app for detecting the automatic buttons is in short text mode which allows all printed text to be read aloud to the operator in real time as the text comes into focus. The alternative mode that the user can activate if the text is unavailable or proves to be difficult to locate is the scene mode. Scene mode allows for a picture to be taken by the app and analyzed for known objects and scenery. The app can analyze the surroundings and give general feedback such as: “there is a metal electronic box/button” which is detected in the frame. | Figure 1 Push To Open automatic button as seen in seeing with AI app |
| Figure 2. Displays the orientation of the smartphone attached to the arm brace. Upon the desirable situation, the user can attach their smartphone on the arm brace and effectively facilitate the communication or any necessary input between the Seeing AI app and the user during the real-time scanning process. The arm brace provides appropriate stability through its secure tension locking mechanism on all four sides of the smartphone and resists any jerking motion caused by the arm. This prototyping piece allows the user to keep their hands free whilst still being able to provide input and hear audio from their phone. | Figure 2. Illustration of the arm brace supporting a smartphone |
| From the illustrations in figure 3a) we can see how the rod has segmented extensions, in the figure it is at ¾ of its maximum length with another segment retracted. In figure 3b) we can see that the rod can be completely collapsed to a ¼ of the maximum length which allows the user portability without impacting the effectiveness or ergonomics of the device. From the final figure c) We also see how the endoscopic camera is attached to the extendable rod and the battery pack that powers the endoscope and connects the camera to the phone. The segments can be turned and locked to prevent the premature collapse of the rod and unlocked with a counter turn in order to collapse the rod which is intuitive and requires no buttons or tedious input from the user, which is ideal for a client unable to see. This rod prototype allows us to begin completing the primary need of the client by negating the need for the client to expose themselves to infected surfaces or locate buttons in a more conventional way. | Figure 3. a) The fully collapsed and b) partially extended length of the rod are shown  c) shows attached endoscope camera and a close up view of the end of the rod. |
| It can be observed that once the endoscopic camera locks the image of an automatic button, Seeing AI notifies the user that they are in the line of sight of the automatic button. Figure 4 shows the extension of the telescopic rod and its orientation when the automatic button requires actuation. | Figure 4. Orientation of the telescopic rod upon actuation of the automatic buttons |

**Target specifications expected vs actual results**

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| --- | --- | --- | --- | --- | --- |
| Metric # | Metric | Units | Marginally accepted value(s) | Ideal value(s) | Prototype 2  (Test 1) |
| 1 | Vibration strength | High,Low Moderate | High-low | Moderate | Low |
| 2 | Mass | (kg) | 0.15-0.04 | .06 | 0.34+0.182+0.01814 = 0.540 |
| 3 | Range | (m) | 1-15 | 3-5 | 0-5 |
| 4 | Sound cue | (dB) | 75-50 | 55-60 | 10-70 |
| 5 | Shock absorption | (N) | 1.5-.4 | >1 | NA |
| 6 | Dimension | (mm) | L:60-200  W:25-60  H: 10-25 | L:90-120  W:30-40  H:15-20 | - Arm band: 158.4x78.1x7.5 mm  - Extension Rod:190-740  - Endoscope: 8, diameter/ 5m length |
| 7 | Intuitive | NA | Yes | Yes | Yes |
| 8 | Cost | (CAD) | <100 | <100 | Approximately $73.51 |
| 9 | Protective covering protection | Low-High | Low-high | High | High |
| 10 | Water resistant | Yes or No | N/A | Yes | Yes |
| 11 | Capacity | GB | 128-0 | NA | 8-512 |
| 12 | Brightness | cd/m^2 | 700-0 | NA | 0-700 |
| 13 | Performance | Low- High Fidelity | Low-High | High | Medium |
| 14 | Complexity | Low- High | Low-High | Low | Low |
| 15 | Materials | Attainable / non- attainable | Attainable | Attainable | Attainable |

The above table shows the original target specification in relation with the actual results of the prototype after the first testing trial. Most of the target specifications are reached with some differences. Some of the limitations of our prototype are that Seeing AI is only compatible with the iOS software. Our client is familiar with using iOS devices and approves of the app. Additionally, a medium level of performance of the prototype was recorded because the endoscopic camera displayed limited functionality as it is only compatible with Android whereas the client prefers using the iOS software. Additional tests need to be carried out to improve compatibility issues and allow for manual override of the endoscopic camera to that of an iOS camera.

**Conclusion**

In conclusion, the third client meeting provided constructive feedback to our previous prototype and also enabled the generation of ideas to improve our prototype towards our client’s preferences. A key improvement that needs to be focused on for the final prototype is to fix the compatibility limitations of the endoscopic camera and enabling a manual override of the iOS camera. Moreover, our team needs to get started on the economics report which will include a list of our expenses, the income statement derived from our business model and the NPV analysis.

**Bibliography**

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