

GNG 2101

Introduction to Product Development and Management for Engineers and Computer Scientists

**Project Deliverable D: Detailed Design, Prototype 1, and BOM**

Lab Section: A02, Wednesday, Lab Group A7

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**Introduction**

The following deliverable develops on the groups project plan and illustrates the group's first prototype of the feasibility of the design. The following deliverable contains the client's feedback that is broken down and evaluated after which we undergo a critical products assumption section for development of our prototype. The deliverable also illustrates the groups design ideations through 2, 3-D CAD models on solid works. Finally a preliminary Bill Of Materials for the project identifies the potential suppliers and products that we may need for future prototyping.

**Client Feedback Summary**

Our second client meeting was on September 30th. Our team presented three conceptual ideas to our two clients Kim Kilpatrick and Nolan Jenikov. Upon presenting Ultrasonic Arduino design, the client gave us some great feedback. Kim expressed the concern of not knowing where to point to be able to effectively disperse the sound waves and said that a trial and error method would be cumbersome. To which, Nolan pointed out that if there could be an implementation of the sensor notifying the user using a high frequency beeping sound as she approaches or is within the automatic button and a low frequency beep as she’s further away. Furthermore, when the IR remote design was presented to the clients, Nolan brought up the concern of placing the external nodes on the automatic buttons and whether the city officials would be undertaking it or whether it would be feasible for us to install it. Additionally, Kim mentioned that although adding an external node on the automatic button would be a quick, temporary solution, it is more prone to vandalism and susceptible to harsher weather conditions. Finally, the AI app + telescopic device garnered positive feedback with minor adjustments and the client found her requirements being fulfilled through the design idea. She also requested that instead of the app taking multiple pictures of the location in question, it would be easier if the app was designed to simply record the movements and objects detected offering a live feedback on the direction to be followed in order to activate the automatic buttons.

**Update of the Detailed Design**

For the physical components of the design, a few changes were made and it was decided that instead of having a lens and a telescopic rod attached on the wrist brace in a side to side fashion, the telescopic rod can be a detachable part that can be manually fixed on the wrist brace as required. This telescopic rod would have a camera lens fixed on the edge of the smallest tube.

**Critical Product Assumptions**

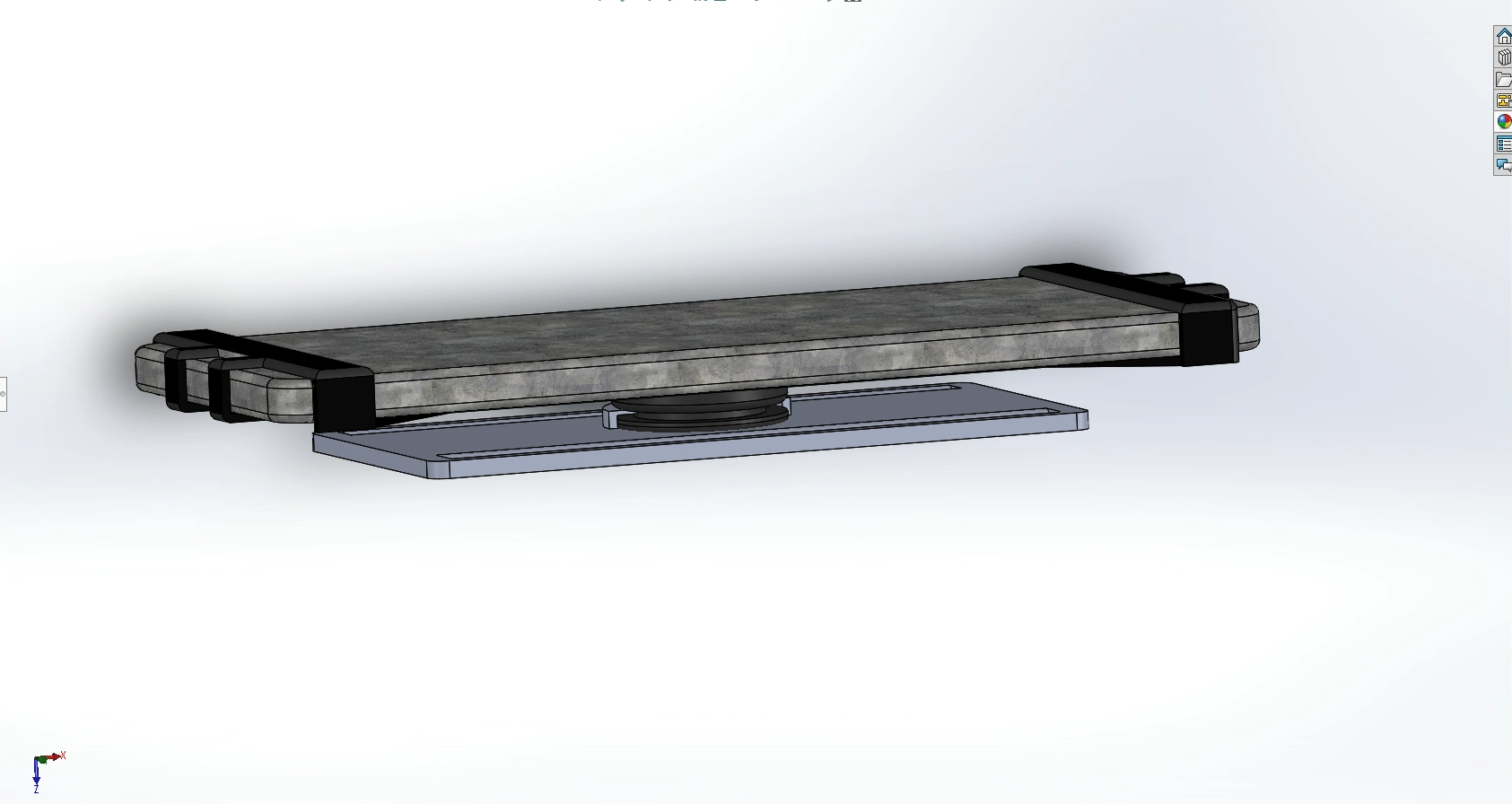
There are many assumptions that need to be made for this project. One of the most critical assumptions is that when actually testing out the rod the beeper should be able to function such that it beeps faster the closer it gets to the button allowing the user to then press it. In our project we are assuming that it works this way however that may not be the case and there is going to be some trial and error. Another assumption is that with the phone being attached to a camera we are assuming that the camera will detect the specific type of button without fail. However, there can be a risk that the camera is unable to accurately detect the different buttons consistently. Finally another critical assumption is that after exactly identifying the button we are assuming that the user is able to perfectly hit the button, in certain scenarios that might not be the case due to weather conditions; slipperiness, ice, e.t.c.

**Visual presentations of the overall concept**



*Image 1: 3D CAD model illustrations of the telescopic rod*

This rod has 4 components, part 1 which is the base, part 2,3,and 4 are extensions of the rod and can be extended as needed by the user to press an external button. The slots at the side of part 1 are used to attach the arm brace, or can be used to attach to any velcro or string to then be attached to the user. This is a static prototype, and is made out of PVC plastic material.



*Image 2 : 3D CAD model illustrations of the phone arm brace*

The phone arm brace has 3 components 1 being the silicon phone holder that secures the phone in place and allows it to be attached and pivoted in place on the plastic clip below. The second part is a plastic clip with plastic slots for weaving in a polyester-cotton arm band to secure the phone and clipping synapse to the arm. The third component is a cotton-polyester arm band to secure the phone and clipping synapse to the user's arm. (The armband is not shown in the 3-D model but is shown in the image next to it)

**Target Specifications Prototyped Values:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Metric # | Metric | units | Marginally accepted value(s) | Ideal value(s) | Actual Values |
| 1 | Vibration strength | High,Low Moderate | High-low | Moderate | Low |
| 2 | Mass | (kg) | 0.15-0.04 | .06 | Na |
| 3 | Range | (m) | 1-15 | 3-5 | 0-15 |
| 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 | L:152  W:63.5  H:4 |
| 7 | Intuitive | NA | Yes | Yes | Yes |
| 8 | Cost | (CAD) | <100 | <100 | Approximately $73.51 |
| 9 | Protective covering protection | Low-High | Low-high | High | Low, Medium, or High |
| 10 | Water resistant | Yes or No | N/A | Yes | No |
| 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 | Low |
| 14 | Complexity | Low- High | Low-High | Low | Low |
| 15 | Materials | Attainable / non- attainable | Attainable | Attainable | Attainable |

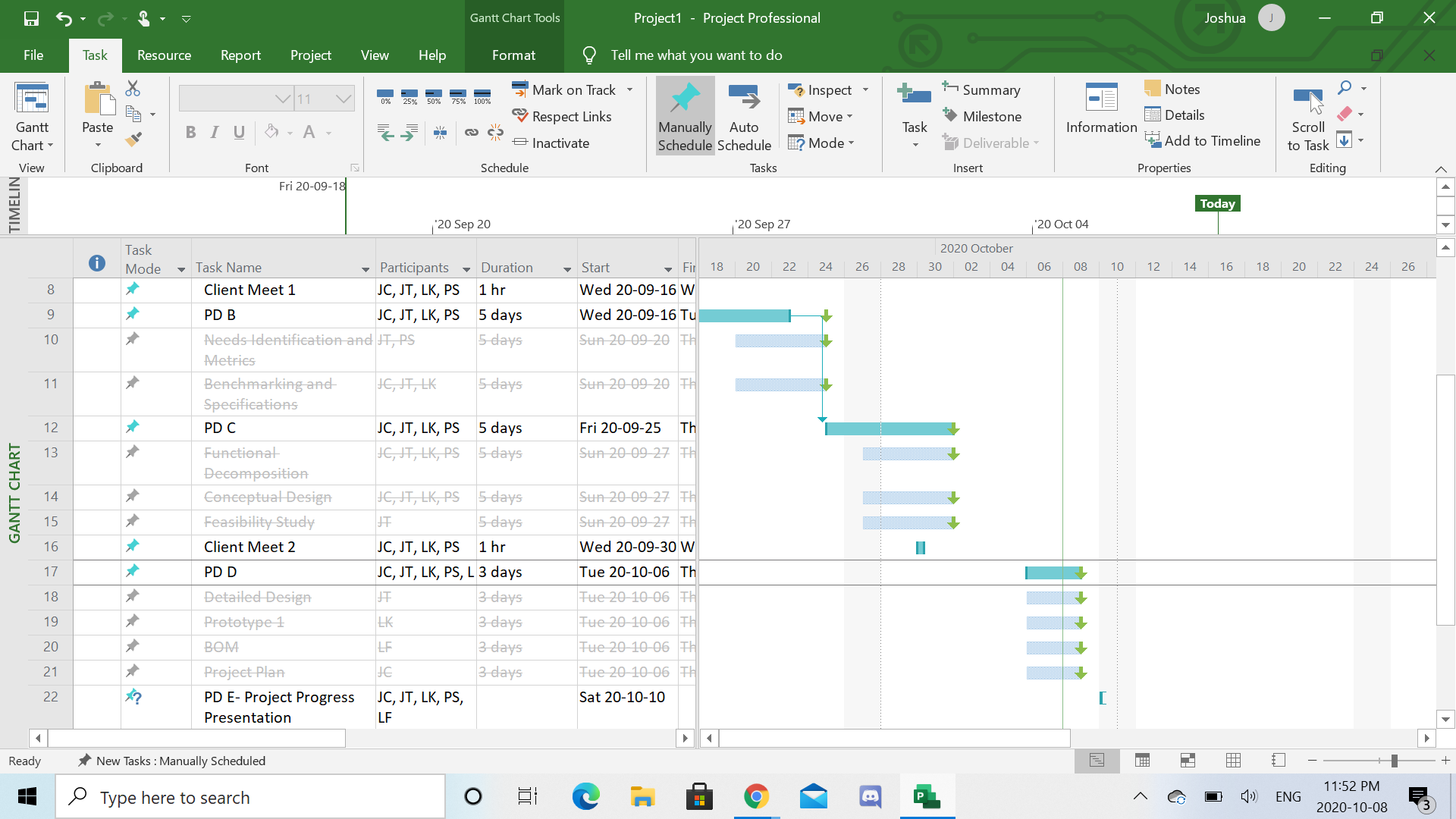
**Bill of Materials (preliminary)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Item number | Part Name | Description | Quantity | Unit cost | Extended cost | Web Links |
| 1 | Camera | Endoscopic camera with 5mm lens (waterproof, wifi connectability) | 1 | 36.99 | 36.99 | <https://www.amazon.ca/s?k=5+mm+camera&ref=nb_sb_noss> |
| 2 | Telescopic Rod made of PVC Plastic | Rod dimensions roughly 150mm x 63mm x 10 mm | 1 | 3D-print | 0 |  |
| 3 | Velcro straps | Ensures rod will fit comfortable and snug to the user (100 pieces) | 1 | 14.99 | 14.99 | <https://www.amazon.ca/100pcs-Reusable-Fastening-Straps-Organizer/dp/B07KDZ2PWR/ref=sr_1_1_sspa?crid=1DSFQE3G6YZNS&dchild=1&keywords=velcro+straps+adhesive&qid=1602197418&sprefix=velcro+straps+ad%2Caps%2C263&sr=8-1-spons&psc=1&spLa=ZW5jcnlwdGVkUXVhbGlmaWVyPUExWFpVMzJGMkpKOUZHJmVuY3J5cHRlZElkPUEwMDQ5NzAxMkpHNlBBS1VGU0NLWSZlbmNyeXB0ZWRBZElkPUEwODI0MDkzMlpLUU42R0RERkU0RSZ3aWRnZXROYW1lPXNwX2F0ZiZhY3Rpb249Y2xpY2tSZWRpcmVjdCZkb05vdExvZ0NsaWNrPXRydWU=> |
| 4 | Phone support | Silicon adjustable armband. 360 degree rotation, easy access, secure. | 1 | 13.99 | 13.99 | <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 | Spring | 12.7mm x 38.1 mm compression spring | 1 | 7.54 | 7.54 | <https://www.amazon.ca/Prime-Line-Products-SP-9706-Compression/dp/B008RG3P7E/ref=sr_1_1?dchild=1&keywords=1+inch+spring&qid=1602197620&sr=8-1> |
| Total cost |  |  |  |  | $73.51 |  |

**Topics to be discussed in Client Meeting III**

The clients will be asked their opinions on the materials used for prototype I and if she thinks the wrist brace made of polyester cotton is comfortable and durable enough and also if the PVC plastic is sturdy enough to extend and withstand the activation of the automatic buttons. Moreover, it is critically important to note whether Kim and Nolan are satisfied with the customer needs and the target specifications, for example: functionality, usability, form and cost, of the prototype. With regards to the functionality of the prototype, Kim would be asked if the prototype presented is functional and meets the client needs expressed during the first client meeting. Furthermore, Kim will also be asked her opinion on the aesthetics and feel of the design regarding its form. She will also be asked to determine if the prototype is easy to use and whether the sensitivity and the range of distance while detecting the automatic buttons is to her liking. The constructive feedback received during the client meeting would then be used to integrate and tweak the preliminary design.

**Microsoft Project Plan:**

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