

## **DIGIMETER: Modernizing Measurement**

### **Abstract**

Measurement is key to understanding and improvement of any engineering design; a measuring device is therefore a basic necessity. The commonly-used ruler and measuring tape are manual tools with fixed lengths and units; moreover, they are made of rigid materials unsuitable for curved measurements. To measure more efficiently, we propose a novel device ‘Digimeter’ that uses technological advancements like electronic circuits, sensors and a digital/audio output. This hand-held device can take measurements of objects or mark out specified lengths on them. The design will have built-in components to ensure that measurements are accurate and the limitations of conventional tools are overcome to a large extent. An associated mobile app will enable calculation of the area and volume of the object if desired. We believe that such a device could be of great value to craftsmen, designers and engineers in understanding their objects and handling them.

Lord Kelvin once said “When you can measure what you are speaking about, and express it in numbers, you know something about it.” Measurement is an essential tool in the practice of engineering for it promotes understanding of the system and enables improvement. It is sometimes termed as the starting point of man’s creativity and a dimension that stimulates development.

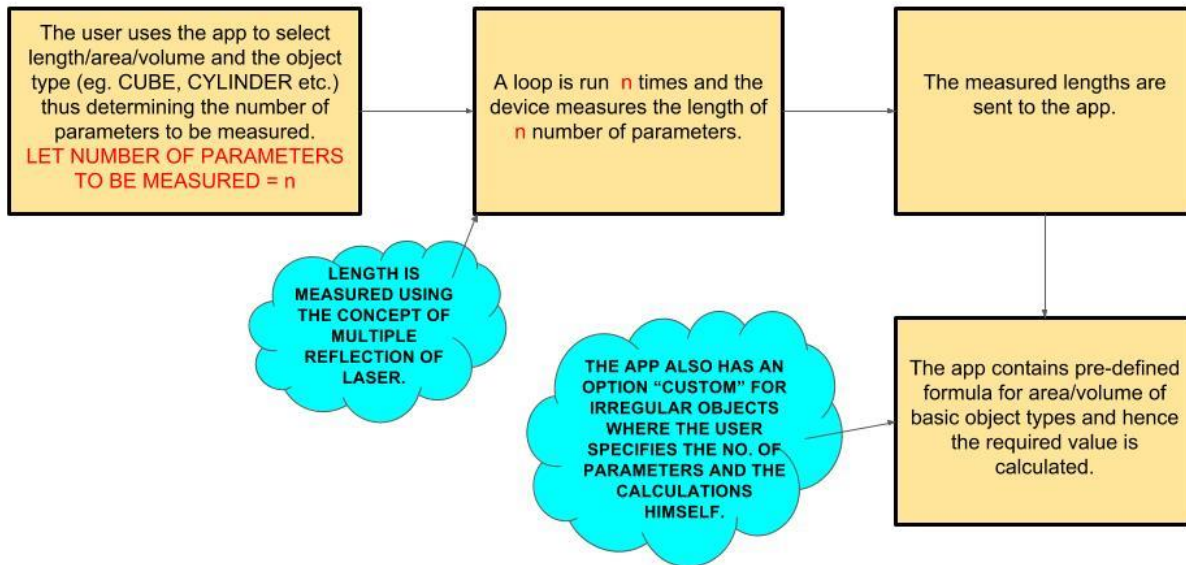
Conventionally, the practice of spatial measurement is carried out using tools such as a ruler or a measuring tape. However, these have certain limitations:

- They have fixed lengths; for longer lengths, repeated measurements are needed that can result in errors.
- The measurement units are fixed with only two scales being possible on the edges.
- They are made of rigid materials like steel or plastic which do not bend easily and hence may not be suitable to measure curved surfaces.
- They may require two people to hold onto the ends as the end-hook does not always provide substantial grip.
- The reading of the measurement is manual and may lead to parallax errors.

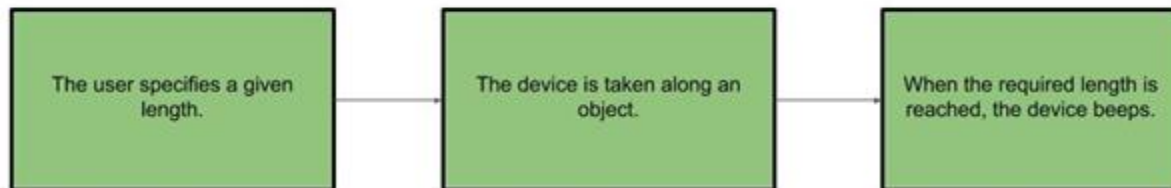
In light of the above limitations, and in line with the basic intent of this project to design and build a device which has a practical application in daily life, we plan to make an improved measuring tool. For this purpose, we propose a torch-sized hand-held device to:

- measure the length of the path the device traverses (Application 1)
- measure and mark a given length (Application 2)

### APPLICATION 1



### APPLICATION 2



For Application 1, the device is moved along the line desired to be measured, with the distance covered being displayed digitally. For Application 2, the device will beep when the distance input has been achieved. In both cases, the units for measurement can be chosen from several alternative options available on the device. Also, we plan to incorporate a mechanism to ensure that while traversing, the device is moved parallel to the desired line and this direction is maintained throughout (perhaps by producing a beeping sound using sensors in perpendicular axes if the set threshold limits are crossed).

We also plan to develop an associated mobile app to extend the device's usage to calculate area and volume. If the user selects these options, the app will provide the user with further choices like rectangle, circle etc. for area and cuboid, cylinder etc. for volume. The formulae for relevant calculations will be pre-fed into the app and the required number of parameters are either directly measured or input by the user. Once these parameters are determined, the app would perform the necessary calculations and display the result.

We expect this device to successfully overcome many of the inadequacies of conventional tools mentioned above. It will not only facilitate basic measurements such as finding the dimensions of day-to-day objects, but also enable the calculation of the area and volume of regular shapes. It has the potential to be a handy device for architects, craftsmen, designers, carpenters, civil engineers, etc. and have applications in other diverse areas such as pattern creation, quantity estimation, surveying, mapping, etc. With further enhancements, it could include a writing tool like a pen/pencil or serve visually challenged individuals via an audio system which enunciates measured values. The ability to undertake measurements of irregular shapes could also be incorporated into the device at a later stage.

Group No. 12

Team Members:

Ayushi Srivastava (2016025)

Sharmistha Gupta (2016193)

Surabhi S Nath (2016271)

Swati Gaba (2016273)