

Development of a mobile optical microscope at low cost

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Optical microscope is an instrument, which uses visible light to magnify small objects that are not visible to our naked eyes. A typical light microscope used in our laboratories, can be very expensive and difficult to handle due to its weight. A maximum magnification limit of this instrument is ~1500X. An attempt is made to develop a small optical microscope that is very easy to handle with low production cost.

The base of the microscope was made by an outer cover of a hard disk drive. Then a 15 cm long PVC pipe was attached to the base by gluing. A glass piece of 2cm × 2cm was placed on the top of the PVC pipe. It acts as the stage of the microscope. The prepared slide can be placed on this stage. A normal glass slide cannot be used here due to its size and thickness. Therefore, instead of the slide, a 2cm × 2cm size phone screen protector can be used. The specimen can be placed between the two layers of screen protector. Because screen protector consisted of the glass and a protecting film over that. Small earphone clip was used as the stage clips to hold the slide rigidly. The lense of a web camera was set to the top of the PVC tube above the glass stage. It was a 5 Mp camera lense with 30 mm radius of curvature. This lense act as the objective lense of the microscope. This lense gives nearly 40X-60X magnification. A white color bright Light-Emitting Diode (LED) was placed under the stage as the light source. It was powered by a 3.1 V phone battery. The intensity of LED can be controlled by using a volume controller. It can change the resistance (R) of the LED. Therefore, current (I) is changed. ($V=IR$) Thus intensity is controlled. So it acts as the condenser of a normal microscope. As there is no need of electricity power to this microscope, it can be easily used as a mobile instrument.

The eyepiece was prepared by using a laser lense. It gives 10X magnification. The tube was attached to the PVC tube by using a spring. So it can be moved very easily. Focusing of the eye piece can be controlled by turning it around. It is the fine focus of this microscope. The movement of the objective lense around, acts as the coarse focus of this microscope.

A total magnification of 400X- 500X could be achieved using this microscope. The total cost of production was around LKR 1500. This mobile instrument has potential to deliver better magnification with few improvements, without spending huge amount of money on other kinds of microscopes.

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