A Review for Digital Microscope Using Raspberry Pi

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Abstract: This paper provides the way of digitization of the microscope by using the raspberry pi kit which includes the touch screen and the Pi camera. We demonstrate the use of the raspberry pi 2 kit as an alternative to the USB camera so as to directly view the data and analyze. The raspberry pi kit would lead to the instant detection and the review of the sample which could be sent directly through internet. The main concern in this paper is to decrease the work of a biologist and getting a better view for the sample to demonstrate and examine the sample.

Keywords: *Raspberry pi, touch screen, digitization.*

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I. INTRODUCTION

A microscope is the basic necessity for a biologist as it is used for the detection of the microbes. Though, microscopes play an important role in the one's life, yet working with it is very difficult as one has to be very careful and précised while using it. Therefore, the basic idea behind this paper is the digitization of a microscope which would lead to ease the man work and would make it possible for the biologist to save its important sample data for further use. [1]

Raspberry pi is also known as a mini computer which can replace a general computer. Different languages can be used to operate the raspberry pi like Linux, open CV, raspbian, etc.

The Pi camera and the pi touch screen are best compatible with the kit which makes it easy to interface and operate them. The raspberry pi kit is low in cost and uses less power consumption which makes it best for the system.

II. REVIEW FOR THE SYSTEM

The use of a compound microscope can be done by digitizing the system using raspberry pi kit. The raspberry pi kit can be interfaced to the Pi touch screen and the Pi camera. Python and open CV can be used for the system programming and GUI development. The camera will be placed to the microscope's eyepiece through which the enlarged image could be captured. The Pi touch screen will display the sample image which would be connected to the raspberry pi kit.

Raspberry pi kit will enable the system camera and the touch screen. The touch screen is 7" in size and will display quite clear image of the system. The Pi camera is 5 MP due to which the picture quality will be good. The raspberry pi has the SD card in which the data can be stored, saved or sent to another microbiologist for further consent or advise. This advantage of the system will help the microbiologists to work in the remote area where the facilities are less and the possibility of bringing or checking all the samples is not possible.

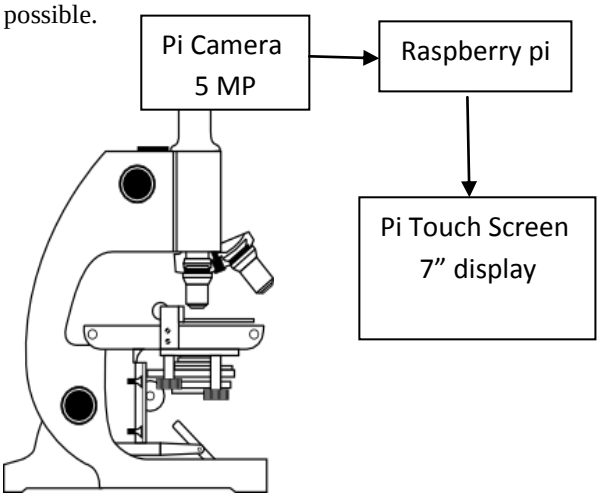

Figure: 1.1: System Block Diagram[5]

Through the GUI of the system, the pi camera and touch screen can be enabled and through camera, which is placed over the eyepiece of the microscope, the sample can be seen on the display screen and the picture can be captured when the desired position of the sample is achieved by adjusting the fine and coarse of the microscope. The enlargement of the sample can be controlled by changing the lenses of the microscope according to the need. LED light attached to the microscope will be needed to see the sample cells clearly.

III. POWER CONSUMPTION

Power consumed by a raspberry pi kit is very less as compared to the general purpose computers. Therefore, use of USB camera will increase the power consumption as it would need a computer to be operated on, whereas, the raspberry pi consumes 5V and 700- 1800mA[4], which is very much less than a general purpose computer but has all the features which a normal computer has.[1]

IV. CONCLUSION

After achieving all the connections, the digitization of the microscope will be enables with less power consumption. Also, less eyes' fatigue will be there for the same. The digitization will enable the sample picture to be sent from the laboratory to any other place through internet in minutes. The living cells can be monitored continuously without any difficulty. Additionally, video capturing application can also be made for living microorganisms.

The lens will allow difference in the enlargement of the system as the can be changed. If the eyepiece is of 15x zoom, different lenses can be used like, by using 10x lens, the sample enlargement will be 150xx times, as given in the table below.

Eyepiece	**Lens**	**Total Enlargement**
15x	10x	150xx
15x	45x	675xx
15x	100x	1500xx

Table-1.1: Enlargement of Sample

A sample can be zoomed to 1500xx. Red blood cells, white blood cells, cancer cells, plant cells, bacteria in water and other liquids, etc are visible at this enlargement.

In a nutshell, we would like to conclude that the digitization through the raspberry pi kit will decrease the eye fatigue and the result will be more précised and accurate due to more visibility and data storage. Moreover, if a reference sample is given to the raspberry pi, it can be used for a particular detection of the cells or defect in the cells which would be very helpful too.

V. REFERENCES

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