Laser Spot Size Measurement Using A Webcam
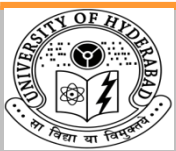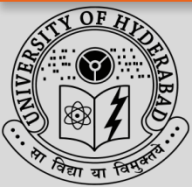
MATLAB EXPO 2017
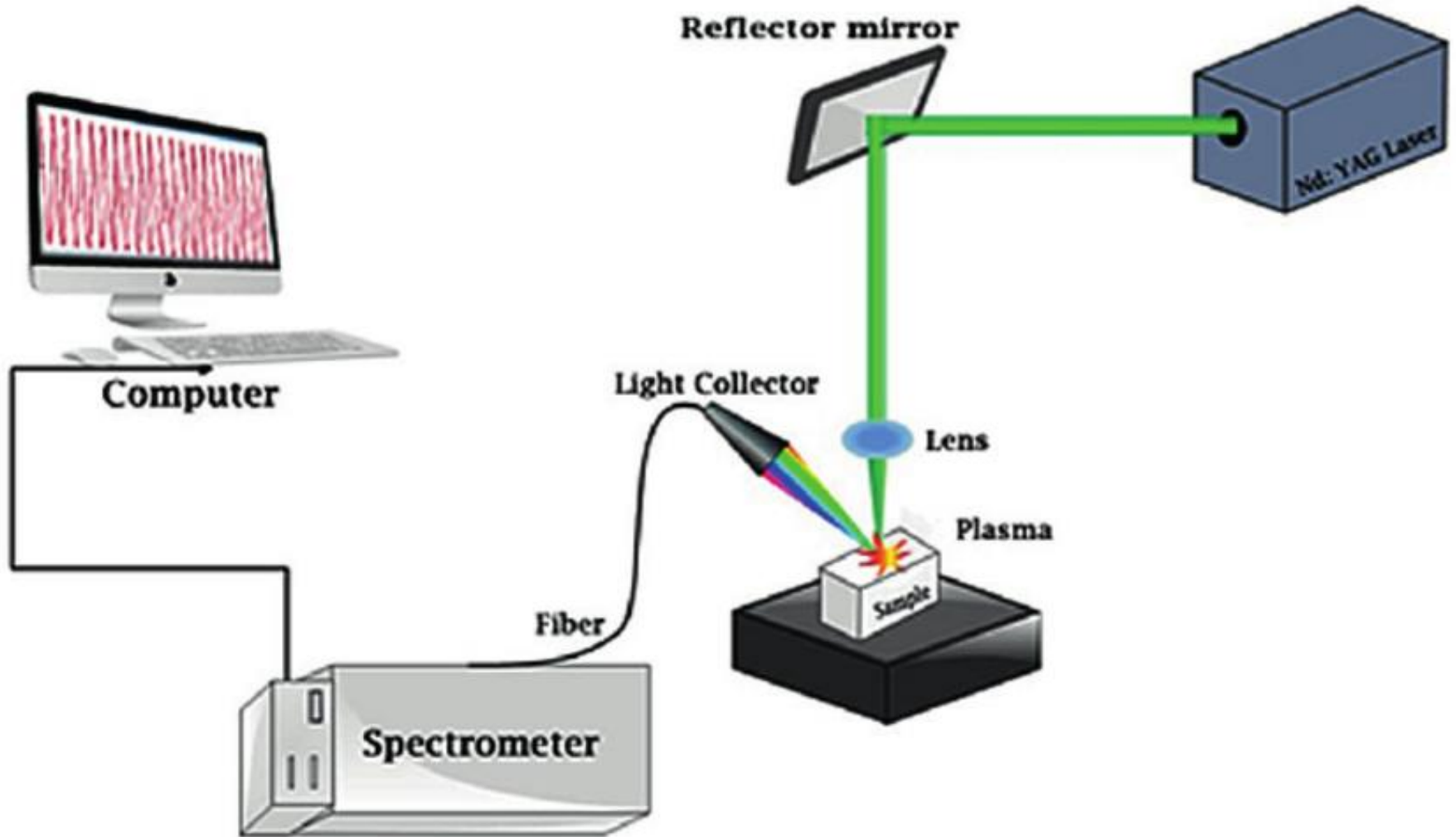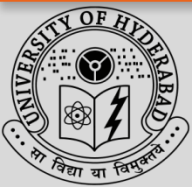
Dr. G. Manoj Kumar
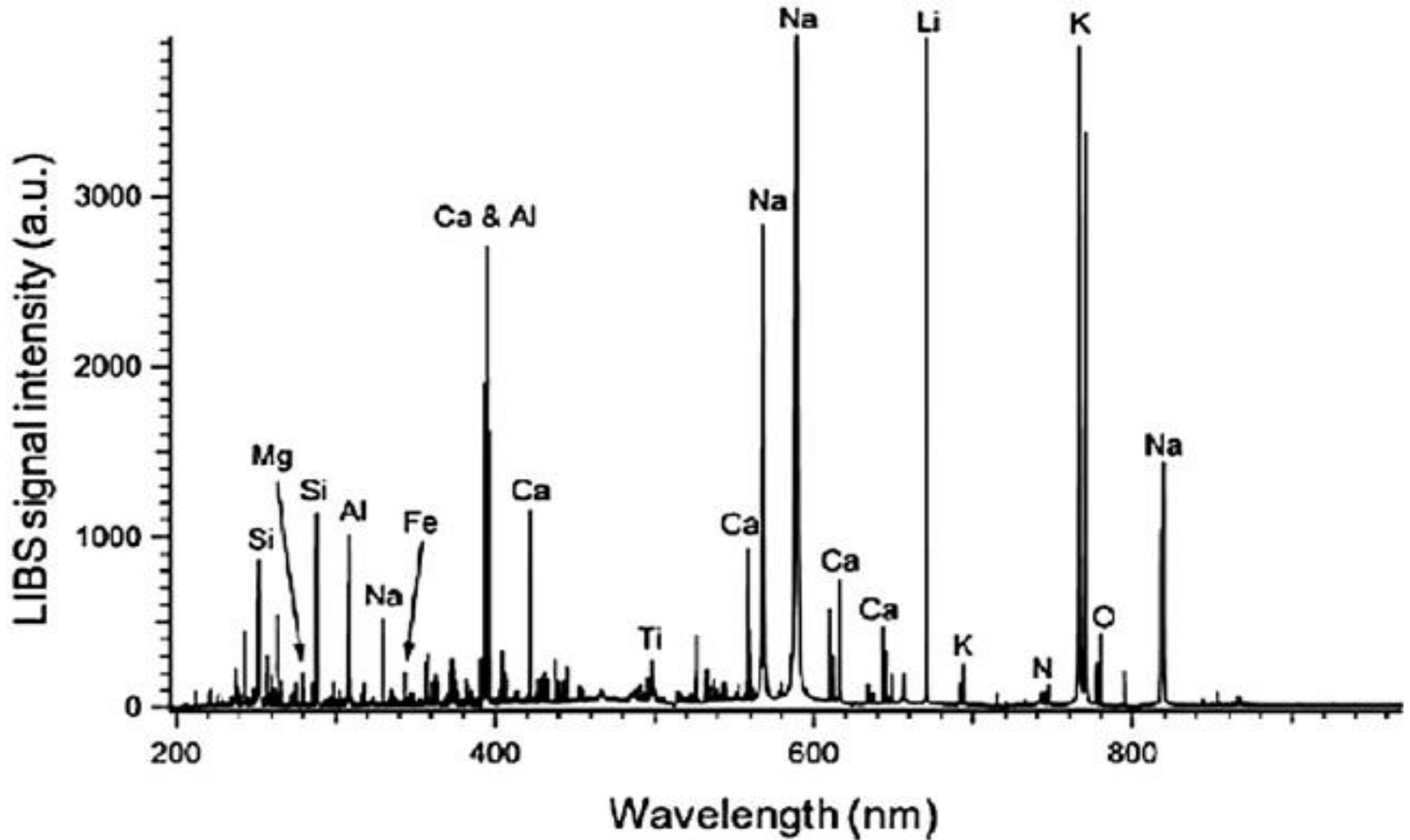**Rajendhar Junjuri**
Rohit Suresh
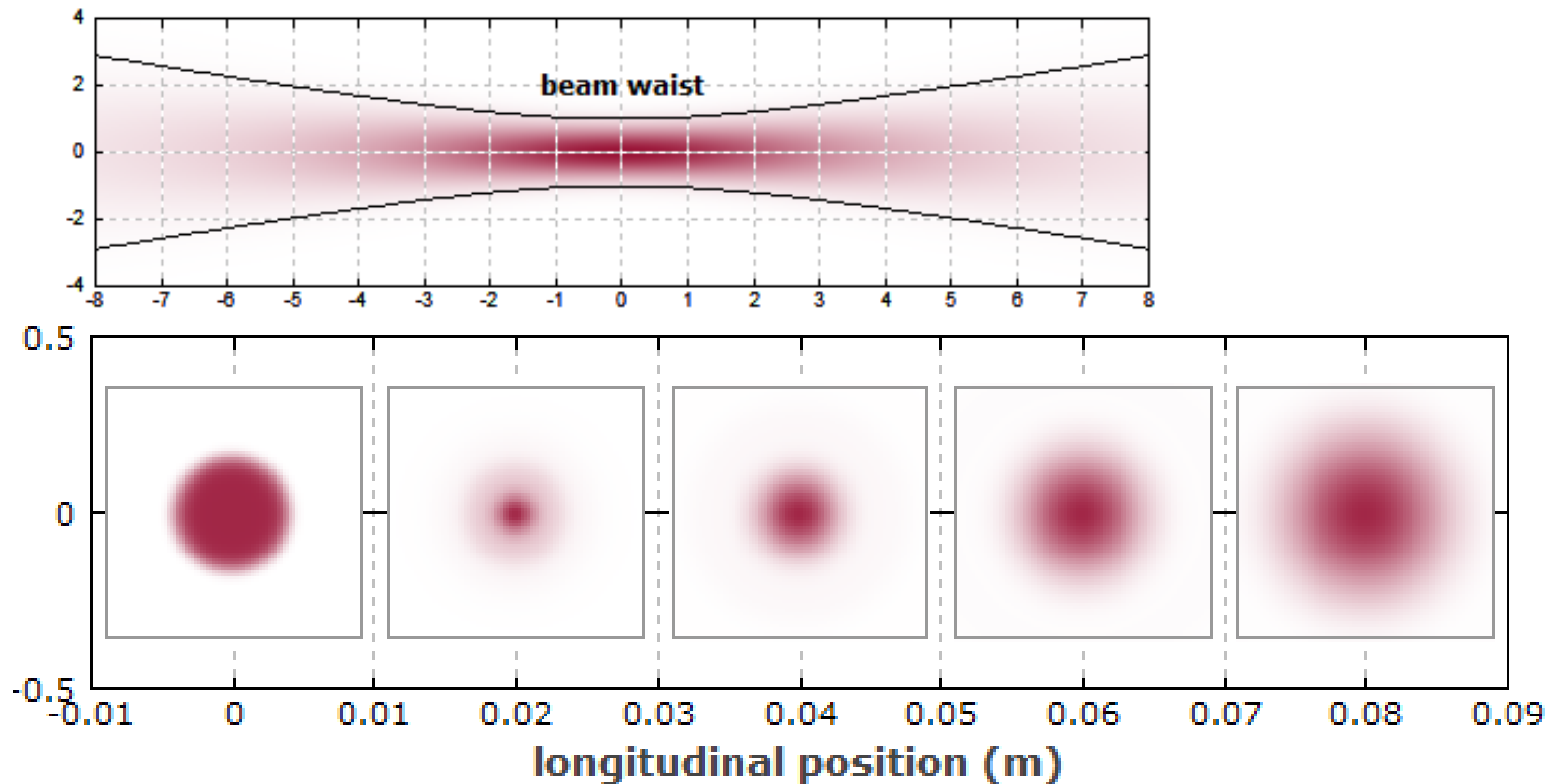
Project Description

What is LIBS?
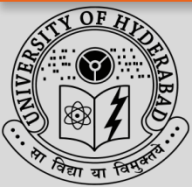
Sample Spectrum

Need for Spot Size

Energy requirement for LIBS- every material has a different threshold energy for its breakdown. Knowing the Spot size enables us to accurately tune the laser to the threshold requirements of that particular material under study.

Motivation for a new method

▸ The usual method of using a knife-edge or blade is very labor intensive.

▸ Our method can be performed by a single individual in a very short amount of time.

▸ This method is also cost effective since it uses an everyday webcam.

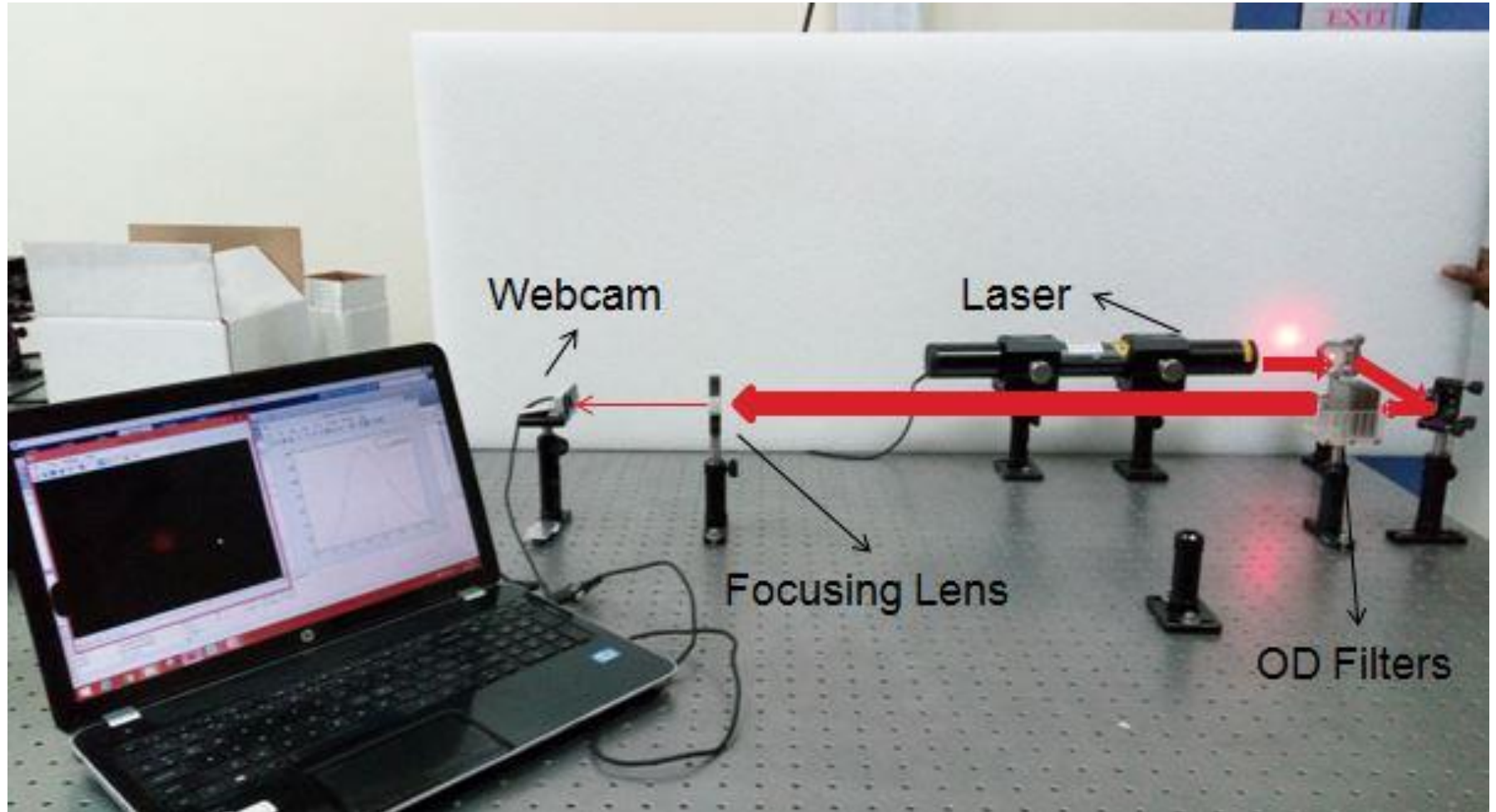▸ He-Ne Laser

▸ OD Filters

▸ Focusing Op

▸ Webcam- M   m VX-700

Experimental Setup

Webcam

Laser

Focusing Lens

OD Filters

The procedure of this method has two parts:
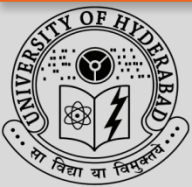
▸ Image Acquisition

▸ Image Processing
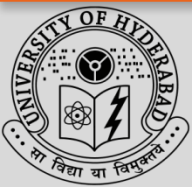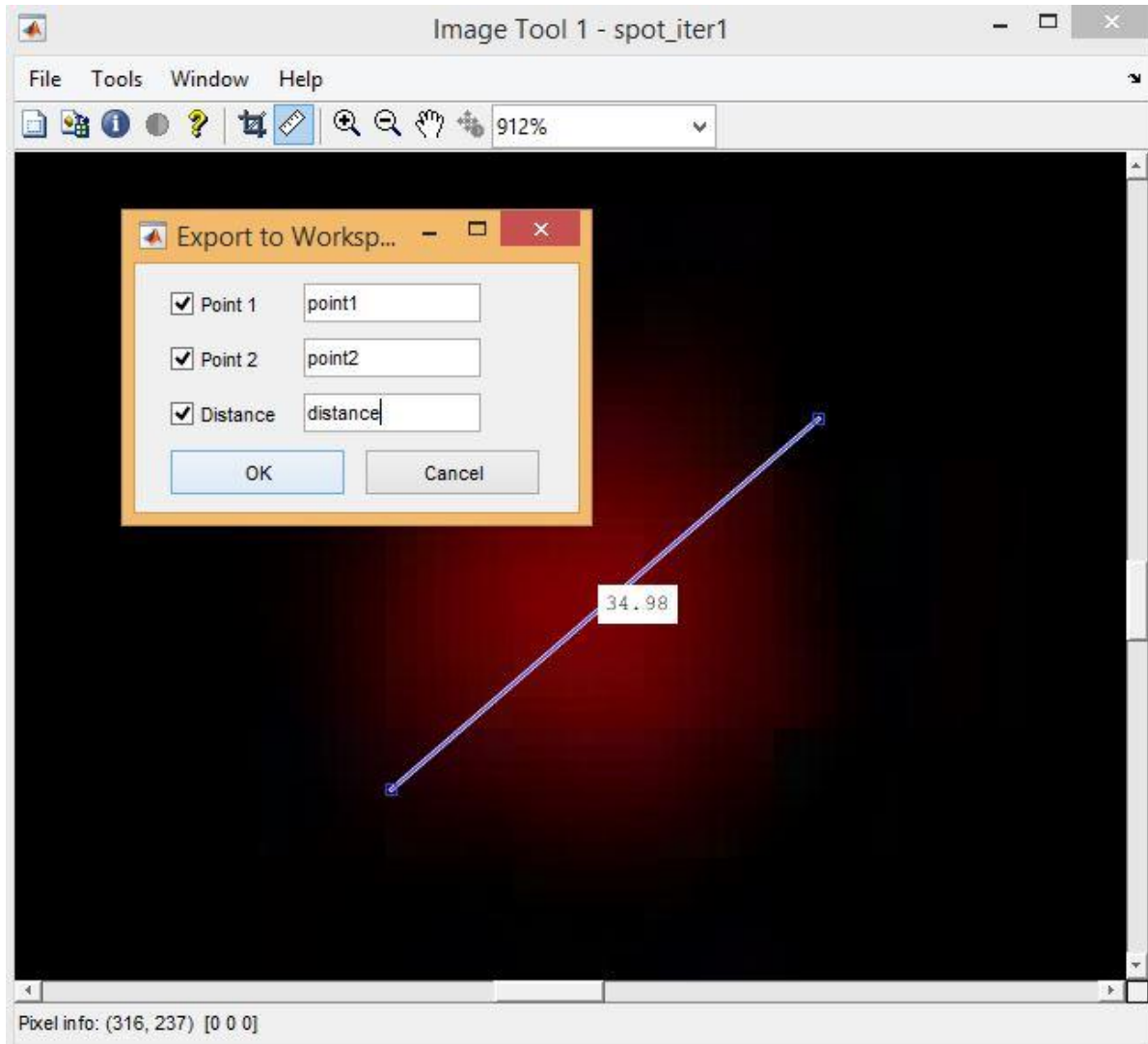
Mainly, 3 tools from MATLAB feature in our method.
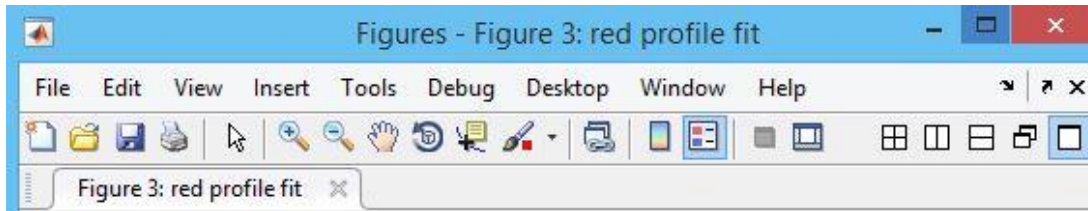
- ▸ imtool
- ▸ improfile
- ▸ cftool

IMTOOL
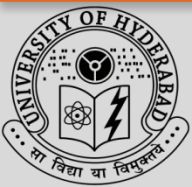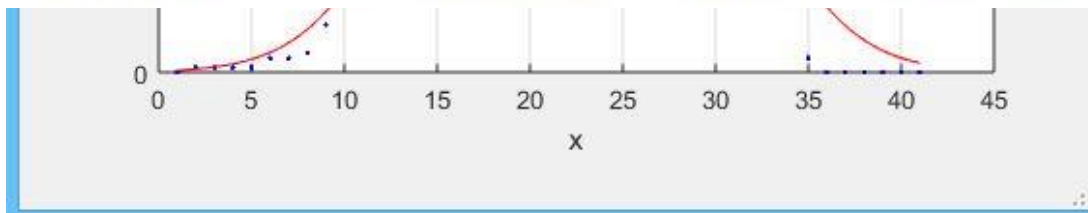
IMPROFILE
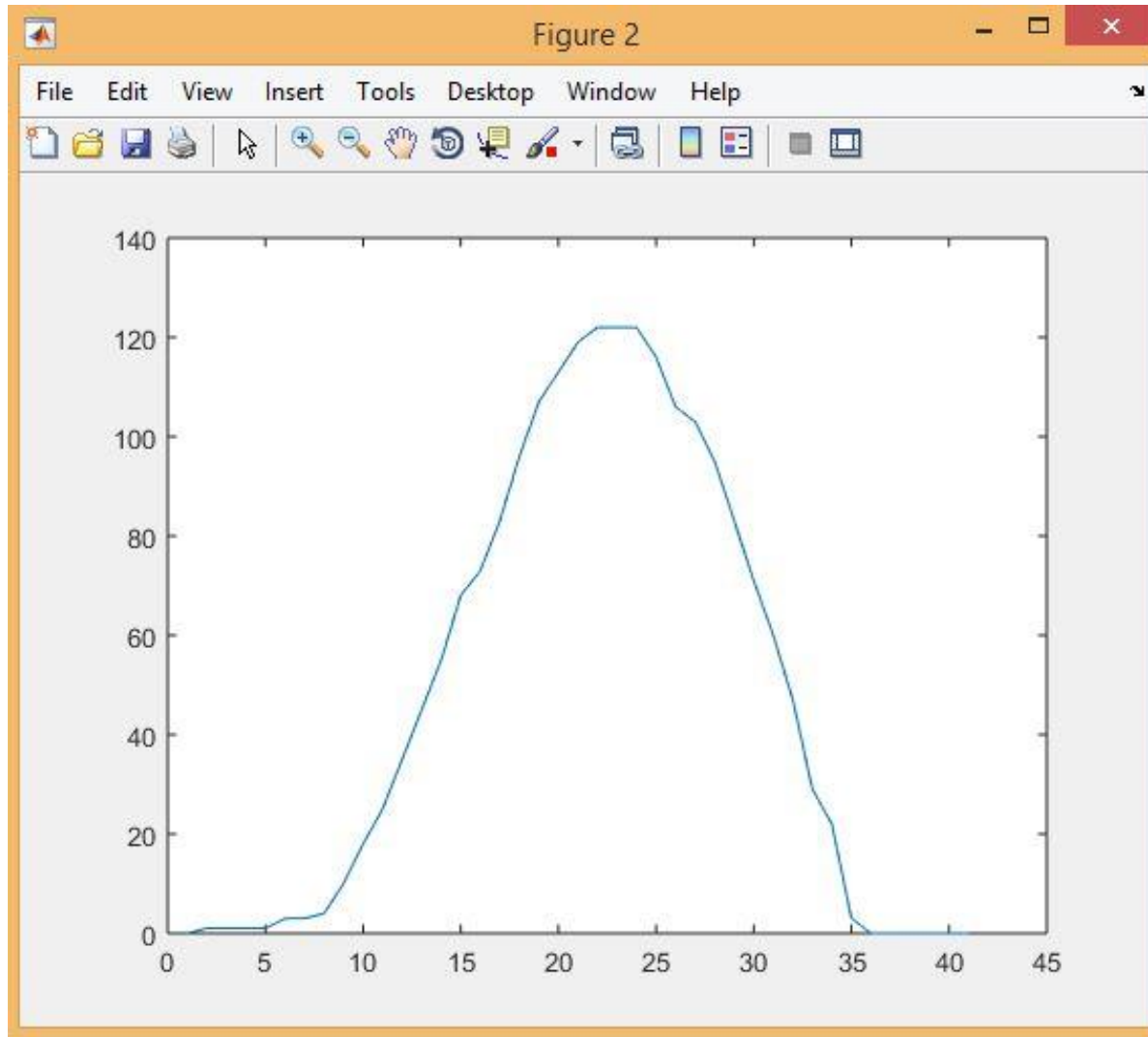
CFTOOL

fitresult =

General model Gauss1:
fitresult(x) = a1*exp(-((x-b1)/c1)^2)
Coefficients (with 95% confidence bounds):
   a1 =   125.9   (121.9, 129.8)
   b1 =   22.61   (22.38, 22.84)
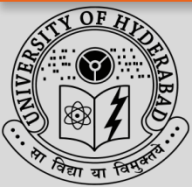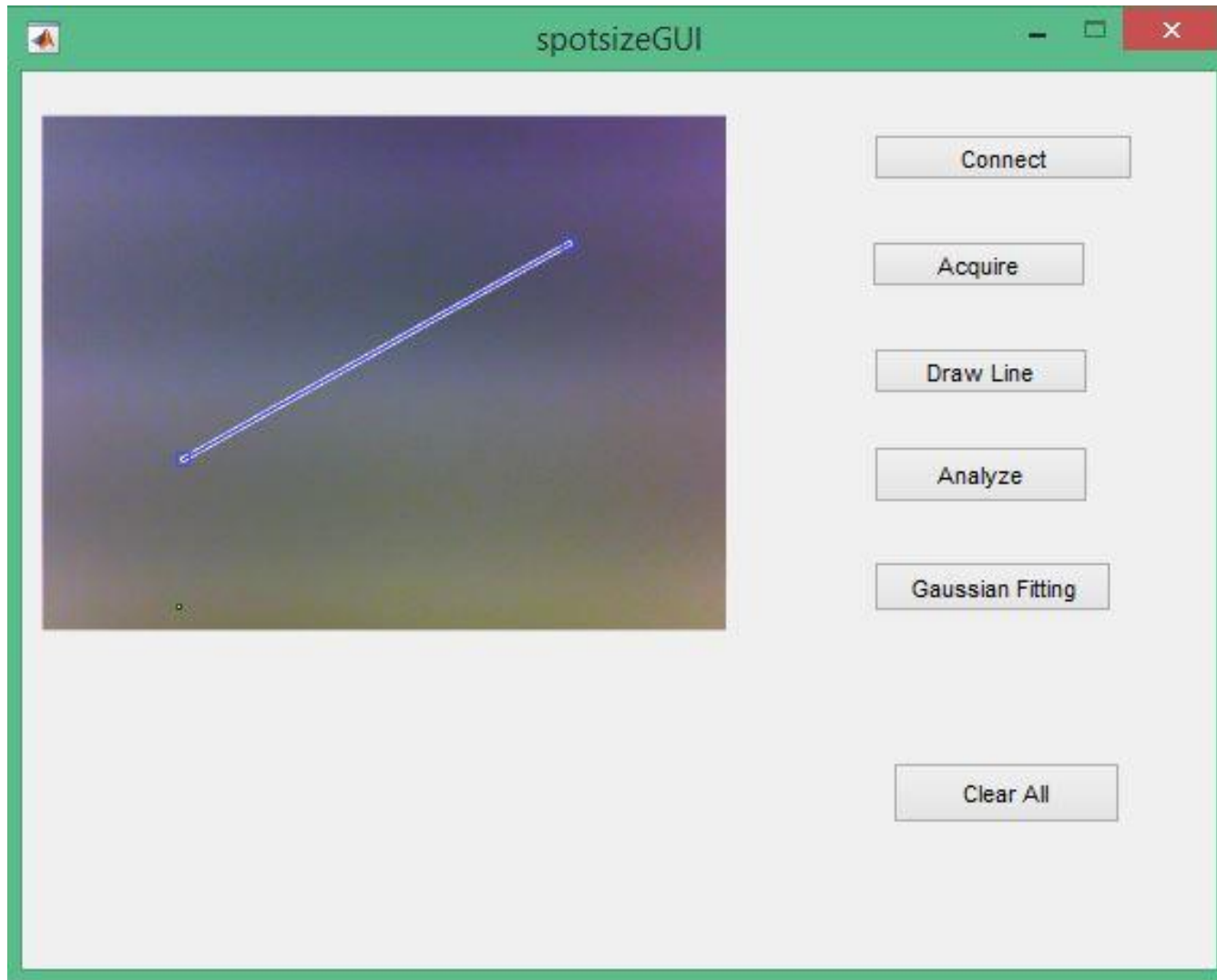   c1 =   9.002   (8.675, 9.328)

Interpretation of Data

- We use the FWHM of the fit(b1) to determine the spot size.

- The results of the fit are obtained in terms of pixels.

- The physical size of each pixel on the sensor is 4.8 microns.

- Using this knowledge, the spot size of this iteration of the experiment is calculated as 108.528 microns.
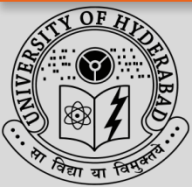
MATLAB GUI for the method

Results

Iteration #	Approx. Angle wrt X-axis	FWHM in **pixels**	Spot Size in **microns**	Theoretical spot size	%error
1	45	22.61	108.528	128.409	15.48256
2	0	20.29	97.392	128.409	24.15485
3	90	23.76	114.048	128.409	11.1838
4	135	18.94	90.912	128.409	29.20122
5	22.5	23.3	111.84	128.409	12.9033
6	67.5	25.11	120.528	128.409	6.13742
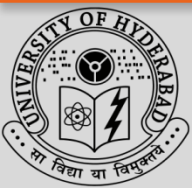
Advantages

▸ This is a low cost method since it uses only an ordinary webcam.

▸ This method involves no moving parts, leading to a decrease in the possibility of errors.

▸ This method does not require multiple persons to implement and hence is less labour intensive than the other methods.

THANK YOU