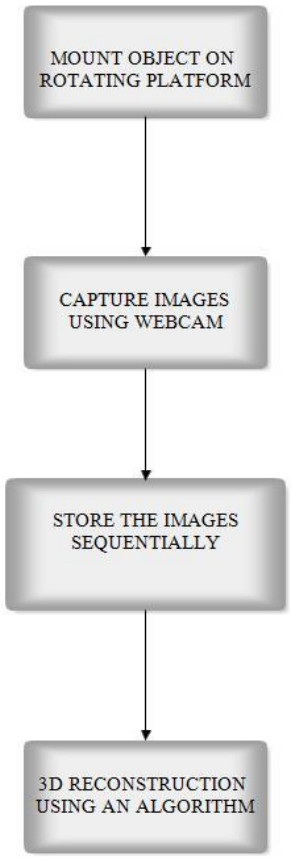
2D TO 3D CONVERSION

1. INTRODUCTION

3D images provide a depth and perspective that we cannot achieve from 2D images. 3D Modeling is not a novel concept in itself as it has been attempted before and considerable research has been extended in that field. Most of these methods have some inherent shortcomings and flaws. The problem with some of these technologies is that it is very expensive and can only be afforded by huge corporations. We will be trying to make our technique relatively inexpensive and portable to a large extent.

2. FLOW CHART:



3. OPERATION:

First a rotating platform has to be created on which the object can be mounted. The rotation of this platform is to be controlled by a microcontroller and a stepper motor. The rotation occurs in discrete steps which are programmed at the micro controller. The resolution of the 3D image depends on the number of images which are used to reconstruct it. Therefore the degree of rotation is a control for the 3D image resolution.

Once the images are captured they have to be stored sequentially on the computer using the USB interface. USB is chosen over other alternatives because of its wide and ready compatibility on a wide range of platforms. The webcam image capture is closely synchronized with the rotation of the platform so that the image is captured at the exact moment when the platform is stationary. The following is a series of images of a cup with rotation angle $\alpha = 80º$.

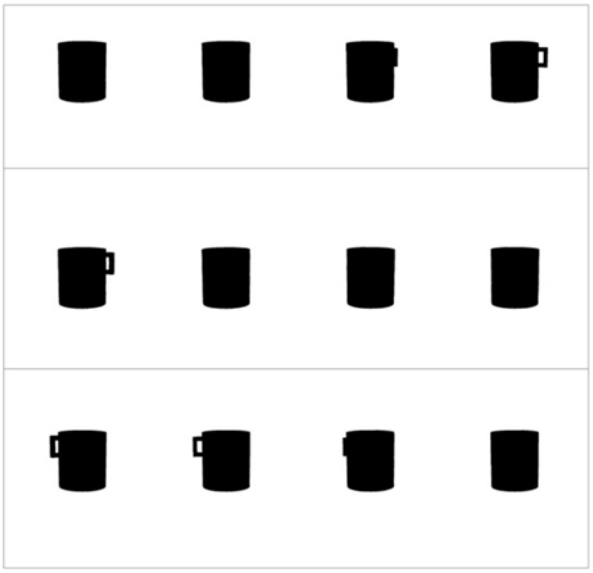


Fig 2.2 Collection of images generated for the solid cup with $\alpha=80º$ [2]

The images from different angles are then used to reconstruct a 3D image. Image stitching algorithms perform this task. The following is an example of such a reconstruction of a cup using the images shown above.

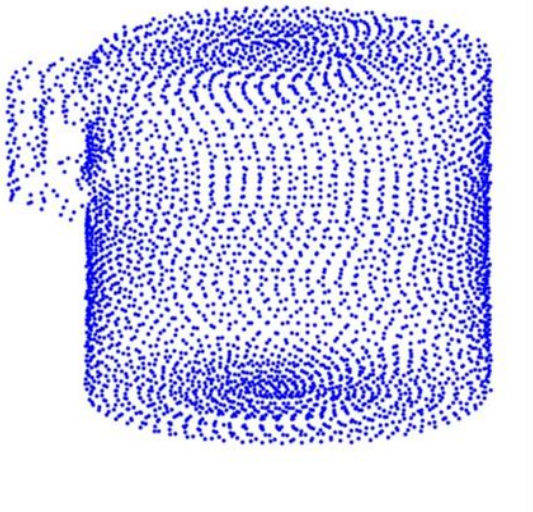


Fig 2.3 Reconstructed 3D image

4. BLOCK DIAGRAM

The block diagram of the hardware setup is given below in Fig 3.1

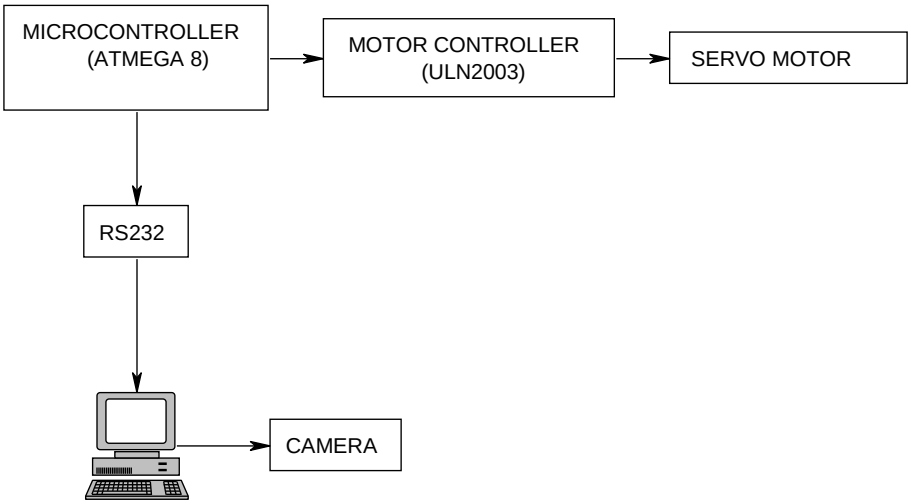


Fig 3.1 Hardware setup block diagram

5. FUTURE WORK

The current proposed model is merely a prototype and is not very user friendly. Therefore its use will be restricted to engineers and other technicians. To increase the scope of its marketability the whole unit can be integrated under one central control panel just connected to the pc via a USB port. The control of the rotating platform and the camera settings can be integrated at one user friendly interface.

The proposed algorithm does not account for surface irregularities. Therefore objects with notches and other asymmetric irregularities are not successfully captured. Advanced image processing algorithms which can figure out the dent on the surface of a 2D image by the shadows formed and the light pattern can be integrated into the current algorithm. Thus a more accurate model can be created reducing the limitations on the general shape of the object that can be modeled using this project.

The micro controller used can be changed to one with a re writeable flash card. Therefore the resolution settings [degree of rotation in one step] can be easily changed as required. This makes the unit more versatile as compared to the one with a read only micro controller in which the settings cannot be changed once it is burned onto the memory.

To keep the computational requirements minimum the current algorithm reconstructs a 3D image from a relatively fewer number of images. This is a tradeoff between the resolution and the time required to build the image. If a suitable algorithm can be developed which reduces the number of calculations required, more images can be used for reconstruction therefore increasing the accuracy of the 3D model in the same time span.