Team Name

E.Y.E. (Enhanced The Eye)

What?

It is essentially an assistive device for the low visioned people (targeting specifically school-going children and university students). Its structure is like that of a regular safety glass with a camera fixed in the middle and a beam splitter glass mounted in front of it to act as a screen. The camera takes in the live feed of the surroundings which is displayed on a laptop screen and is then transferred to an android device by remote access feature. The user can zoom in and out of feed by rotating a knob present on the arm of the glasses. Also, other video parameters such as brightness, contrast, exposure etc can be varied.

Why?

Low vision patients have few options to read at distance. The available devices are annoying, unaesthetic, heavy and expensive, relying in complex optics mounted on the spectacles or hand helded (what keeps them away from writing at the same time as reading).

Potential impact

This device meets the need of **246 million** people suffering from low vision for a low cost device to enhance their vision . Huge market scope.

How?

The system was developed in stages, initially a simple web cam was looked so as to acquire the images . The image acquisition tool in matlab was used so as to get to know the various parameters that can be controlled (of the webcam) .

Observation

parameters like brightness, contrast , white balance , focus can be controlled to an extent. neither digital or optical zoom was possible with the webcam

Microsoft Hd webcam was then tested, and it possessed many of the required parameters like digital zoom , brightness , contrast, tilt and sharpness. The system was then set up to be portable by mounting it on regular safety glasses . Though the extent of zoom was not great , it was satisfying to present the proof of the concept. Auto focus was implemented so that there would be no issue of focus adjustments with the end user.

The most notable thing was that there were many parameters which could be controlled directly by using software thus reducing the hardware on to the system.In order to have an overall

advantage, a suitable telescopic lens was selected and directly mounted on to the front end of the web cam.
Observations.
the telescopic vision was leading to a major black portion on the picture being captured.. But there was a well defined picture which was precisely performing as per the commands.

As the discussions proceeded , it was recognised that the system had the in built facility to record the motion pictures, or still images. This would have substantial impact as it would become easier for the user to again retrieve the magnified image of the lecture of interest.

In order to support both far and near vision. A display was setup in which a android phone was used and the display was split up using a beam splitter (acrylic sheet mounted at 45 degrees as generally done. .

This improved setup had the advantage that the user sees the virtual image as though it were a real image in a room (added benefit with respect to visualization).

IN reference to an individual who uses the system the brightness and contrast can be adjusted to a precise value. But in order to make the system a versatile engine all/a few selected parameters can be adjusted dynamically, can be used in applications where the problem might be with brightness or contrast.

Progress so far

What worked well?

- The image acquisition via a webcam
- Zooming in and out of live feed (Digital Zoom)*
- Altering other parameters of video feed (such as contrast, brightness etc)
- Installation of a knob to control zooming (via an arduino kit)

*a max of 1.5X to 2X magnification could be supported by the webcam (in bulit)
optical zoom via telescope was taken into context so as to get the essential aspect of magnification and zoom of the developed system .

What didn't work?

- Dynamic control of Optical zoom feature due to lack of hardware
- direct mount of lenses onto the glasses uses rubber caps lead to image overlap and a part of the image was also lost.

- The commercially available My3D was tested ,the setup was not portable and the images overlapped.

Next steps

1. Install switches to toggle between the other video parameters to be altered and vary it using the same knob.
2. Get suitable hardware to enable optical zooming instead of digital zooming (precisely a webcam with optical zoom will enhance the picture quality and the telescope can be avoided).
3. Introduce video recording function as well.
4. *It was observed that there were 2 images(superimposing on each other) at a particular angle of the beam splitter . This can be further developed to bring in 3D vision in to the foreplay. This gives depth perception which can be played upon to bring out amazing features (when a red and blue filter are employed simultaneously onto the glasses one on either of each , it should generate a 3D image , from an image which was previously superimposed by a 2D image).*
5. graphic LCD display or pico projectors will be used to have a direct image transfer onto the glasses.

Component List

1. safety glasses
2. MIcrosoft Hd webcam
3. telescopic lens (1mm to 3mm) can be enhanced as per availability
4. A mounting to provide a rigid support of the web cam
5. android phone as display and a beam splitter(acrylic sheet)
6. arduino based serial control for facilitating zoom
7. Matlab based code (serial communication via arduino) to allow for rela time monitoring and