PROJECT OVERVIEW-
LOW COST PROJECTOR AS AN EDUCATIONAL AID
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**AIM:**

The aim of this project is to make a cost-effective projector, the purpose of which is to aid teaching in educational institutions from a minimum number of resources available.

Teaching has come to a point of time where only book-learning will not suffice. Learning by seeing and doing has proved to be much better in improving student’s creativity as well as comprehensive ability than learning through books. The sole goal of this project is to provide educational institutions even in remote areas, an effective tool that can improve the quality of education.

**PRINCIPLE:**

The principle of a projector is simple. The main parts of an LCD projector are

1. Light bulb (acts as the light source).
2. LCD screen
3. Lens.

The light bulb (LED) generates light which passes through a condenser lens (helps focussing the light) and illuminates the LCD which is fitted with Fresnel lens in the front and back. The video signal input to the LCD will be captured by the light from the bulb and then a lens is used to project this image on a wall or a screen.

The normal projectors we see are a lot complicated than this but the basic principle remains the same. This is shown below diagrammatically.

![Diagram of projector parts](image)

The light source preferably LED of approximately 30 watt working on 12v and 1.6 Amp will be enough for our projector. The halogen bulb used in normal projector is powerful but generates a lot of heat which our LCD cannot handle. So we use the LED giving up a little picture clarity which will not bother us because we are spending a lot less amount of money here. The condenser lens is used to focus the light. This is normally available in the head lights of vehicles. The use of Fresnel lens is to
focus light which normally takes a spherical lens much thicker to focus thus reducing the space. It works on the principle of refraction. Its working is given below diagrammatically.

The light passing through LCD will generate the corresponding image which will pass through a magnifying lens and onto a wall or a screen. The LCD will be about 3”-3.5” 640x480 pixels using 12v with AV input. This AV input is taken from a DVD player or a computer. This is obtained by opening the rear view monitor of a car and disabling the back light. The rear view-monitor is taken apart and again put together so that the LCD is exposed to the light coming from the light source. The distances between LCD and condenser lens will be according to the focal length of the lens used. An additional fan can also be used to cool the parts of the projector as it is important for proper working of the LCD. The audio output is given to external speakers. The set-up shown above is encased in a preferably wooden box that will not allow external light improving the functionality of our projector by several times.
**BUDGET:**

1. LED - 2000 INR
2. LCD - 2500 INR
3. Condenser lens - 500 INR
4. Fresnel lens
5. Magnifying lens
6. Fan - 2000 INR
7. Speakers - 300 INR
8. Misc. - 1000 INR

**Total** - 8500 INR

**POWER CONSUMPTION:**

The power specifications of each of the components:

- LED - about 30 Watt
- LCD - about 3 watt
- Fan - about 2-3 watts
- DVD player - about 35 Watts
- Speakers - 6 Watts

**TOTAL = around 85 watts.**

Normal OHP or LCD projectors consume about 150 watts (without speakers and DVD player). Our projector consumes half of that power. There is a trade-off for this. The resolution we get would not be as good as the normal projectors.

The light bulb i.e, the LED is the source of the light to our projector. So, we have to take care of its specifications. Choosing an LED that is high powered may damage the LCD screen and choosing a low powered LED will not give a good picture. The heat sink may absorb some heat but a proper LED with less power consumption and more luminosity has to be chosen. A typical projector bulb will have about 2000-3000 luminosity. A 1000 lumen LED is enough for our purposes.

The LCD is taken from a rear-view monitor. The LCD is removed from the case and the backlight is disabled. Then, it is placed at focal distance of the LED. It will have both audio and video input. So, any audio and video output can be connected to it.

An estimated screen size of about 2.5 feet can be obtained.
Parts used:

LCD rear view monitor from a car.

Fresnel lens

Condenser Len
**Design:**

Normally, according to the focal lengths of all the lenses, the length of the projector is very long. So, we place two mirrors (plane) which will reflect the light falling on them at right angles making the arrangement look like a “U” from a straight line.

The LED we use will also generate a lot of heat. We attach a heat sink to it which will reduce the heat and also multiplies the life of the LCD. A fan is also used to further reduce the effect of heat generated.

It should also be seen that all the components are at the same height since we are dealing with light rays here. Solid stands are to be made for each of the components to rigidly fix everything in position.

An arrangement to shorten the length of the Projector
Basic Block diagram:

AC Power Supply

- DVD Player
- Speaker
- Ac to DC Converter (20V, 4.5Amp)
- Fan Regulator
- LED Regulator
- LCD Regulator

- Video signal
- Audio signal

- Fan
- Condenser lens
- LED
- Fresnel lens 1
- Fresnel lens 2
- LCD
- Magnifying lens
Voltage Regulator Circuit:

We are using a laptop charger as our AC to DC converter.

Conclusion:
A cost-effective, power effective projector with a trade-off of resolution can be built. It is a good choice since a DVD data storage disk costs very less and large amounts of video can be stored in it. It can be used for entertainment purposes.

Future plans:
- To connect this to computer as well.
- Play multiple file-formats.
- If internet connection is made available, then it can serve as a useful medium for better education standards providing high amount of relevant material which will be at hand. It also helps in synchronizing our villages with modern technologies boosting the confidence of the younger generation in rural areas.
- It can help improving governance in villages as well as solving day-to-day problems.
As of now, we are working on the voltage regulator circuit and a better quality LED acquisition. Due to the unavailability of certain components, we were not able to assemble all the parts. These parts which are hard to get are currently being shipped to us in-order to complete the project. We are anticipating this process to be completed by the 1st week of October.