Indian Institute of
Technology, Kharagpur

Frugal Engineering

LumiScreen

A Frugal Mobile Screen Projector

Our Team

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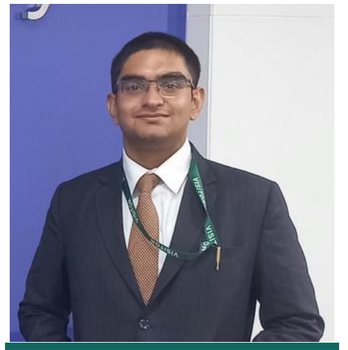

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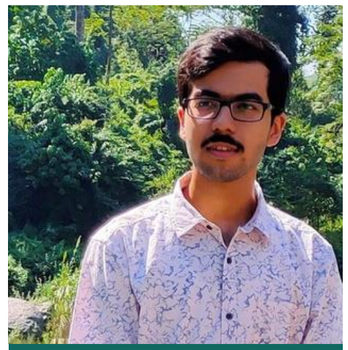

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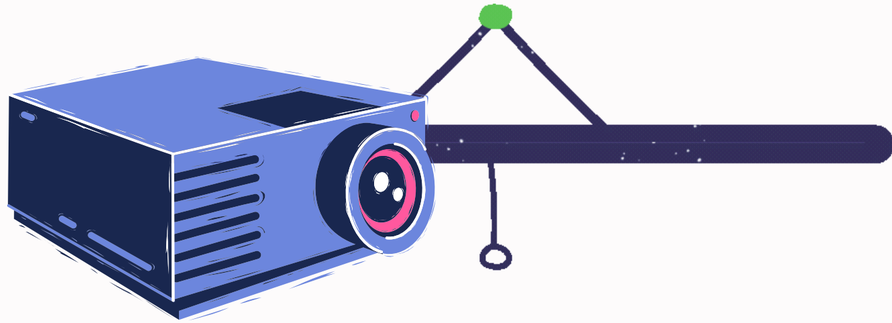
Why Project ?

Projectors enhance communication by displaying clear visuals for large audiences, making them essential in business, education, and entertainment. Their affordability and versatility make them valuable in both professional and personal settings.

One of areas where the impact has been tremendous over the years is in



TRANSFORMING EDUCATION SECTOR

- 65% of the population are ***visual learners***, making projectors an essential tool for better understanding of complex topics.
- In larger classrooms, a projector can ensure every student sees the material clearly, promoting ***inclusivity***.

The global projector market was valued at ***USD 21.9 billion in 2020*** and is projected to reach ***USD 26.9 billion by 2025***, with a CAGR of 4.1% during this period

Government initiatives, such as the Digital India campaign, are leading to greater adoption of ***projectors in public schools for smart classrooms***.

Cons

Portability

The portability of projectors is often hindered by their size, weight, and the need for additional components like power cables, screens, or external speakers. This makes them less convenient to transport and set up.

High Power Consumption

Traditional projectors require costly bulb, so most of them consume a lot of energy, but energy-efficient or low-lumen models can help cut down on power usage.

Device Compatibility Limitation

A common issue with many projectors is their limited compatibility, as they often only support projection from laptops or similar devices. This restricts users from easily projecting content from smartphones or tablets without additional adapters or wireless solutions, reducing flexibility for quick presentations or media sharing.

Making it Frugal

High End Light Source

Laser and hybrid light sources are used in premium projectors for superior brightness and longer lifespan. Instead, LEDs can be used which are widely available and far more cost effective.

Advanced Connectivity

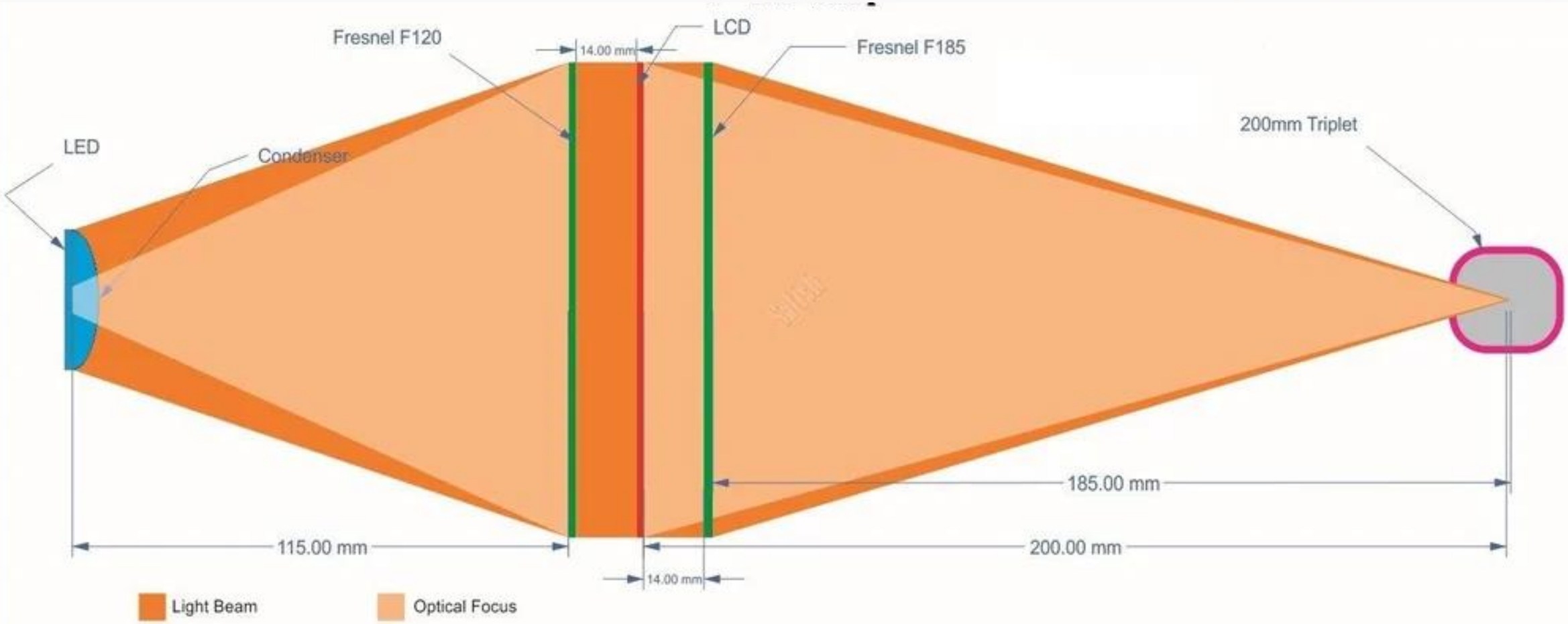
High-end projectors often include multiple HDMI ports, Wi-Fi, Bluetooth, and sometimes Ethernet. In a frugal design, these extras are unnecessary. A single HDMI port and USB connection are sufficient to connect most modern devices.

Motorized Projection Lens

Motorized zoom, focus, and lens shift allow users to adjust the image position and size without moving the projector manually. This is expensive. A manual focus and fixed lens setup is cheaper and effective for small spaces or fixed installations.

Other high end features

Expensive image processing chips for color accuracy, image scaling, 4K resolution panel, software support for streaming platforms, built in audio systems, and other such features increase weight, cost, and complexity of use


Fresnel F120
14.00 mm
LCD
Fresnel F185
200mm Triplet
LED
Condenser
185.00 mm
115.00 mm
200.00 mm
14.00 mm
Light Beam
Optical Focus

The setup

Projector Optical Setup Analysis

Light Source (LED with Condenser)

The light beam is directed and focused by a condenser lens, which helps in shaping and focusing the light more effectively towards the projection system.

LCD Panel

The LCD panel is placed at the center of the optical path, where it modulates the light passing through it. This then passes through the subsequent optical components for projection.

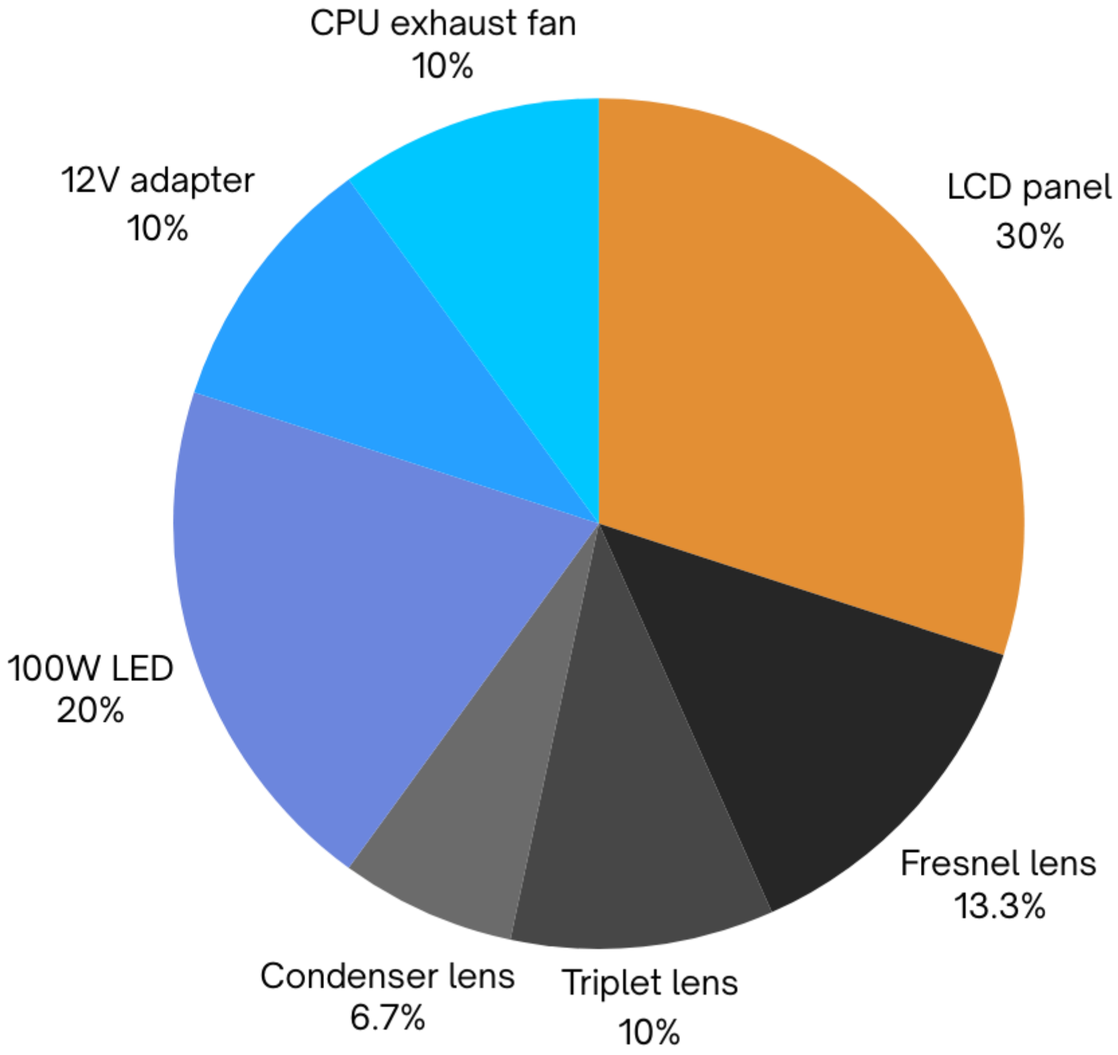
Fresnel Lenses

Fresnel F120 is positioned before the LCD panel to collimate the diverging light from the condenser, ensuring it passes uniformly through the LCD. The Fresnel F185, placed after the LCD panel, ensure that light converges correctly onto the final lens assembly.

200mm Triplet Lens

The triplet lens ensures that the light coming from the LCD, now carrying the image, is magnified and projected onto the display surface. This lens helps minimize chromatic and spherical aberrations, ensuring a clear and sharp image on the projection screen.

Cost analysis



Component	**Estimated Price**
LCD panel	Rs. 450
CPU exhaust fan	Rs. 150
12v adapter	Rs. 150
100W power LED	Rs. 300
Condenser lens	Rs. 100
Triplet lens	Rs. 150
Fresnel lens	Rs. 200

Total cost : *Rs. 1500/- only !!*

Conclusion

The frugal mobile projector provides a cost-effective, portable solution that meets diverse projection needs.

Affordability

Designed with low-cost components, it offers an accessible alternative to expensive commercial projectors

Portability

Compact and lightweight, the device is easy to carry and set up in various environments

Versatility

Suitable for education and presentations, it caters to users who need a focused solution that is easy to use and maintain

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THANK YOU

Any Questions?