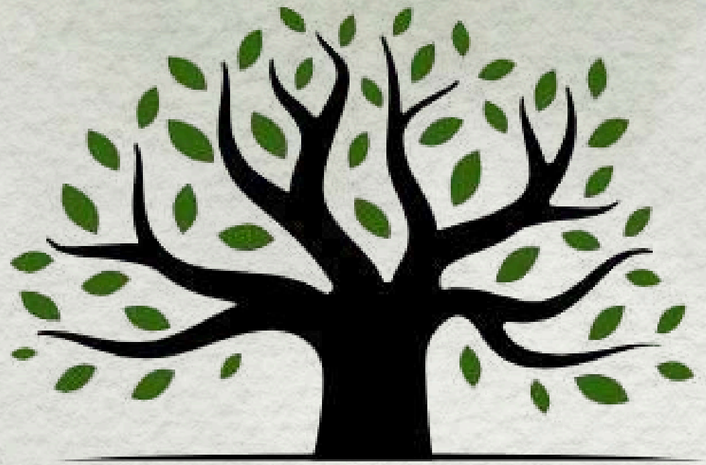

DEEPROOTS

UNLOCK KNOWLEDGE
IGNITE CURIOSITY

TEAM ID:3

TEAM MEMBERS:

GOKUL P

C RANIYA NAZRINE

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KEERTHANA VINOD

ABSTRACT

- Optimizing video streaming for Low-End Devices & Low Bandwidth
- SDGs Covered:
  - SDG 4: Quality Education
  - SDG 9: Industry, Innovation & Infrastructure

PROBLEM

- The inability of video streaming services in low end hardware and low bandwidth networks
- Digital divide limits access to education & opportunities.
- Impact: Hinders SDG 4 & SDG 9 progress.
- Hardware Limits: Low RAM, storage, weak processors.
- Poor Internet: Slow speeds, high latency in rural areas.
- High quality video streaming: The popular video streaming platforms increasing bandwidth and quality to attract high end customers while hindering the usability in low end hardware
- No Offline Mode: Internet-dependent streaming fail in remote areas.
- Complex UI: Heavy animations & interfaces overwhelm users.

Problem Effects

- Education Gap: Rural students struggle with online learning.
- Economic Divide: Limited digital access blocks job opportunities.

Problem Statement

Poor performance on Low end hardware and low bandwidth networks
Codec Incompatibility – Most platforms will migrate to newer codecs which will render older hardware unusable

Digital Divide – These challenges restrict the majority of people residing in rural areas and underserved regions from obtaining crucial digital content.

Limited Opportunity – Unavailability of video streaming platforms with optimization is an impediment to education, communication, and economic development.

.Global Impact – It is thwarting the progress towards SDG 4-Quality Education-and SDG 9-Industry, Innovation, and Infrastructure.

Innovative Solutions

- Lightweight video streaming – Optimize Video streaming using efficient coding practices, low-resource algorithms, and minimal UI elements to reduce system load.
- Using Inter & intra frame compression techniques to compress a video file to lower size for easy playback without loosing noticeable quality
- Offline Access & Caching – Enable preloading, local caching, and downloadable content to allow users to access resources without continuous internet connectivity.
- Low-Bandwidth Mode – Due to efficient algorithm we can achieve a lower bitrate without loosing noticeable quality.

TECHNOLOGIES USED

- FRONT END USED: HTML,CSS,JAVASCRIPT
- BACK END USED: PYTHON,NODE JS

MODULES USED:

- OPEN CV2: for interframe and intraframe analysis for efficient compression
- FFMPEG: for transcoding and video scaling
- EXPRESS JS: Content loading
- File Uploader: Used for handling file uploads

CURRENT SCOPE

- Growing Demand for Lightweight Video streaming
- Growing digital inclusion efforts create an increased need for low-resource applications.
- Advancements in Cloud & Edge Computing
- Cloud-based processing reduces the need for high-end hardware.
- Edge computing improves access in low-bandwidth areas.
- Improved Data Compression & Adaptive Streaming
- AI-driven data compression reduces bandwidth usage.
- Programs supporting digital literacy and low-cost devices.
- SDG-driven projects promoting inclusive technology solutions.
-

PROTOTYPE

PROTOTYPE ACHEIVES : (Without reducing scaling/loosing noticeable quality)

COMPRESSION RATIO:4.42

COMPRESSION PERCENTAGE:77%

FUTURE SCOPE

- Improved use of intra frame comparison could make the compression better
- Highly optimized and resource-saving software will gain more interest in low-end devices.
- AI-Optimization
- AI-based compression will save data usage.
- Smart Resource Management for Performance on Low-Powered Devices
  Offline and Hybrid Technologies
- More education, healthcare, and finance applications to work offline-first.
  Progressive Web Apps (PWAs) gaining traction for universal access.
- Edge Computing and 5G Adopted on a Larger Scale
- Processing at edges to avoid latencies in low bandwidth areas.
- 5G deployment will help to connect people in rural areas.
- Better Government & Industry Hand
- Greater investment for low cost technologies
- Policies for digital inclusiveness & sustainability.

Conclusion

The lack of optimized video streaming platforms for low-end hardware and low-bandwidth networks creates a digital divide that restricts access to education to rural areas. The problem can be solved by using a efficient compression algorithm which can compress the video to a lower bitrate without loosing quality and having a platform with offline functionality, and AI-driven optimization. Future solutions will enhance digital accessibility with advancements in cloud computing, edge processing, and adaptive streaming. Collaboration between governments, tech industries, and NGOs becomes essential for such inclusive and sustainable technological growth: supporting SDG 4 with Quality Education as well as promoting SDG 9, regarding Industry, Innovation, and Infrastructure.

Thank You