TRL 7

NATIVE: Network Aggregation based Tiled Live Video Streaming

Technology Description

The COVID-19 pandemic has shifted most interactions to the online space, including online lectures, hybrid conferences, and remote work. As a result, reliable live video streaming with a high Quality of Experience (QoE) has become crucial. However, in many parts of the world, cellular networks often lack the stability needed to support seamless online participation. To better understand this issue, we measured QoE in terms of lag, video resolution, and dropped calls on Google Meet across three cellular ISPs in New Delhi, India. Our findings revealed significantly poorer QoE compared to similar studies conducted in the US. To address this challenge, we propose NATIVE (Network Aggregation based Tiled lIve Video strEaming), a system that enhances connectivity by aggregating multiple cellular networks using a secondary or helper device nearby, trusted by the user. NATIVE employs tiled video encoding, dividing video frames into tiles, which are then categorized into subsets and transmitted over different network paths based on their importance. The receiver stitches these tiles together for smooth playback. We demonstrated NATIVE using two laptops and a cloud server, with the server functioning as the video streamer.

Technology Components

- Tiled Video Encoding
- Network Aggregation
- Multi-path Transmission
- Helper Device Integration
- Quality of Experience (QoE) Measurement

Applications

- **Remote Education**: Enhancing online lectures and virtual classrooms for students.
- **Hybrid Conferences**: Supporting seamless participation in conferences and events.
- **Telemedicine**: Improving video consultations and remote healthcare services.
- **Live Streaming Events**: Ensuring reliable streaming for live performances and broadcasts.
- **Corporate Communication**: Facilitating remote meetings and team collaborations.
- **Content Creation**: Enabling high-quality video production for creators and influencers.

Who can be the potential users?

- **Students and Educators**: For online learning and teaching in virtual classrooms.
- **Event Organizers**: Facilitating hybrid conferences and webinars.
- **Healthcare Professionals**: Supporting telemedicine and remote consultations.
- **Businesses and Corporations**: For remote meetings and team collaboration.
- **Content Creators and Streamers**: Enhancing live streaming quality for audiences.
- **Government and Public Services**: Enabling reliable communication for public engagements.
- **Research Institutions**: Conducting remote research meetings and presentations.

List of Features:

- **Tiled Video Encoding**: Divides video frames into smaller tiles for efficient transmission.
- **Network Aggregation**: Combines multiple cellular networks for enhanced connectivity.
- **Multi-path Transmission**: Sends video tiles over different network interfaces based on importance.
- **Dynamic Scheduling**: Prioritizes tiles for optimal streaming quality.
- **Real-time Stitching**: Reassembles video tiles on the receiver device for seamless playback.
- **Quality of Experience (QoE) Monitoring**: Measures lag, resolution, and dropped calls to ensure high performance.

THEME : Network Aggregation

DOMAINS :

- Education
- Event Management
- Telemedicine
- Corporate Communication
- Content Creation and Streaming
- Government Services
- Research and Development

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