Collaborative Workforce

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VIP Innovation Competition
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Students:

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In an increasingly globalized world, the need for a robust, natural way to interact and collaborate with others is growing rapidly. Existing solutions are often very expensive, and they do not offer the user a truly immersive experience that yields the same level of productivity as a traditional collaboration setting. The Collaborative Workforce (CW) team within Vertically Integrated Projects strives to develop a rich set of multimedia systems, web applications, and human-computer interfaces to support distributed design and research groups that are the future of a global engineering workforce. The long-term goals of the CW team are to build a fully custom standalone multimedia codec running off TI's DaVinci series of Digital Media Processors (DMP) with Region-of-interest (ROI) video encoding ability. This system will especially cater to mobile devices operating on limited bandwidth and create a hardware-cum-networking solution to replace expensive video matrix switches with a simple low-cost video-over-ethernet system. Video-enabled collaboration will be made available by dramatically reduced setup and maintenance costs, improving its user experience and effectiveness.

Each semester, short term goals are established to act as milestones to completing the long term goals. These milestones include: obtaining DaVinci DMP evaluation boards from TI and setting up a hardware-software development environment, understanding the system design process, and running custom DSP and control code on it. We are currently developing a real-time audio analysis application optimized to take full advantage of the DSP & ARM cores in the DMP using its RPC abstraction (based the DSPLink IPC scheme) running from the DSP/BIOS RTOS onboard the TMS320DM6467T system-on-chip.

The target applications benefiting from our research are numerous. Our solutions are primarily intended for engineering teams that are geographically disjoint. Innovative techniques like those being developed by the CW team go a long way in enabling collaboration for engineers across continents and allowing them to communicate as effectively as if they were in the same room. However, these techniques being pioneered are not limited to just engineering groups. Schools could take advantage of

this technology to improve and expand their distance-learning programs at a fraction of the cost of current commercial systems. Video-over-IP is becoming increasingly popular, but still has a limited market penetration due to its complex nature along with high installation and maintenance costs. The CW team aims to create a robust, user-friendly, and low-cost solution that can be deployed for diverse specifications. Setting up ad-hoc video surveillance systems, live video broadcast from public and private events, and operating inexpensive telepresence systems will be made possible through CW research solutions.

A notable accomplishment of the CW team is the Room Controller application that allows users to remotely control pan/tilt/zoom cameras and displays while making videoconferencing calls between locations. It also has the capability of directly controlling video codecs and other conferencing hardware in order to place these calls. The application uses a drag-and-drop interface and has been tested with hand-held devices like the iPhone and iPad to remotely set up and manage video conferencing calls. This application has been accomplished through a single intuitive web interface eliminating the need for obscure conventional remotes. It now also has the capability to run off a tiny web server on the TI DaVinci DMP.

The plan for the future is to develop custom media codecs on the DaVinci DMP platform to support region-of-interest (RoI) video transcoding and to support streaming RoI-encoded HD video to remote handheld clients. The goal is to overcome all issues of analog cabling by migrating the infrastructure to a fully digital video-over-IP model. A challenge will be dealing with ever dynamic media standards (MPEG-4, H.264 etc.) and their often closed-source nature, as well as platform-dependent optimizations. The process of taking proof-of-concept prototypes into stable market releases is fairly complex and will come with its fair share of challenges.

References

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