REAL-TIME MANAGEMENT OF VIDEOS FOR UAS TELEMETRY SYSTEM

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ABSTRACT

Airborne videos are crucial for monitoring unmanned aircraft systems (UAS). However, the number of videos that could be sent to ground is limited due to the bandwidth of a telemetry system. An architecture of airborne video acquirement system with real-time management is present in this paper. In addition to acquire videos and other data like control commands, that architecture make it possible to manage and switch the videos to be transferred to the ground through telemetry channels for ground real-time monitoring and controlling.

KEY WORDS

Video Acquirement, Video Management, Telemetry System

INTRODUCTION

Camera has been widely used in telemetry system nowadays, especially the UAS flight test. In most case, several cameras will be mounted during a flight test for UAS, and the video images from each camera will be recorded for after-flight use. It will be better to transmit the video images to the ground during the flight test for real-time monitoring. However, video images from only two or three cameras could be transmitted at same time by a radio channel due to the bandwidth limit, even if the images were compressed by methods like H.264. In the other hand, in spite of how many cameras installed on an UAS, only a few video images needed to be displayed at a certain moment during a flight test. The difficulty is that the video sources (i.e. cameras) needed to be displayed varies from time to time.

In some scenarios, only part of the image from one video will be needed. For example, sometimes maybe only centre 1/4 is needed, or only 10 frames from a 24-frames video stream will be needed each second.

Currently, it is obviously that video acquiring is only a small part of a data acquiring system, and there is no such system could meet above requirements. Therefore, we had constructed a new
architecture with real-time video source management for a video acquiring system to meet the requirement mentioned above.

**SYSTEM STRUCTURE**

Shown as figure 1, the system could be constructed by several video acquirement units (VAU) and a central management unit (CMU). This is a distribute structure so that the VAU could be installed near the video source as close as possible to avoid the electromagnetic interference.

![Figure 1 Structure of the video acquiring system](image)

The VAU is composed of video image acquiring modules, compression modules, one record module and one communication module. VAU could be installed near the camera where the video image source located and it acquire and record the video images from that video source, then compresses the video images into digital streams by using H.264 and transports the stream to CMU. In addition, it could pass the sync shutter signal to the cameras.

The CMU is composed of communication modules to receive video streams from each VAU, and a record module in accord with Chapter 10 of IRIG 106 Standard [1] to record everything it received, a PCM module to enable the transmission of selected video streams by Radio. Furthermore an Ethernet module could be added to maintain the connection with other systems. Meanwhile, it is better to have a time center module for receiving the IRIGB time code and acting as a time sync server for this whole video acquiring system.
VIDEO MANAGEMENT

In addition to the system management and communication management not described in this paper, we had designed video management for the system. There are three kind of video management, image tailor management, sync management, and video dispatch management. The specific video management could be activated by a command, a timer predefined in setup file, or a certain event.

The image tailor is performed in VAU. There are two types of tailor, picture tailor and frame tailor. When only a certain part of picture in every frame of video is concerned, the picture tailor could be enabled to send only a specified part of image in each frame of a video to CMU. If the picture in a video did not change too much from frame to frame, the frame tailor could be used to reduce the frame rate in a video source. The purpose of image tailor is to reduce the data rate to let more videos to be sent to ground by radio.

The synchronization is crucial for using multiple video cameras as a measuring tool. Therefore, we integrated a time-sync module in CMU to maintain the synchronization for the system, in which a new time sync circuit clock recovery technique [2] and 1588 time protocol were both applied [3]. The CMU will maintain the system clock and issue the sync shutter signal to cameras through the VAU.

Finally, the video dispatch function was fulfilled in the CMU. The switch of videos to be sent by radio could be predefined by the setup file. During a flight test, if the situation meets predefined conditions, the data stream of the designated video would be switched to the radio. Unlike the one-way radio in ordinary telemetry system, almost all UAS has an alternative radio channel to receive control commands from ground center. So we also designed to switch the videos by a dispatch command from ground center during a flight test.

CONCLUSION

More colors have been brought to a video acquiring structure after the video management has been added, it becomes a totally complete system rather than traditional simple data acquiring. With this system, we can take the most advantage of the vision monitoring during a flight test of UAS just like there were always our eyes on it.

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REFERENCES