Video Recording and Replay of Dual Display Multifunctional Radar Console

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Abstract

The scope of this application is to provide the functions of Record and Replay at Dual Display Multifunctional Radar Console. This module will help operator in maintaining records, undertake analysis and training of operators. In this application, operator shall record the entire scenario session as it occurs on the display screen along with the MMI functions.

Backup of the recorded file in RRO Server can be taken on CD/DVD by console and thus giving a backup tag to all the files.

Keywords

Record and Replay, Radar Monitoring, Dual Display Multifunctional Radar Console, playback, radar video recording, radar data, maps, data bank, flight data

1. Introduction

Record and Replay at Operator (RRO) level is a software module of Radar which captures the PPI and the operator actions on the dual 24" monitor display called Radar Monitoring & Control Station. It has the provision for recording and saving the files for the single display as well as dual display having any aspect ratio.

This paper brings forward the implementation and design of RRO-R in radar. This technology is indigenised and first of its kind to be implemented in radar. Earlier in most of the radar systems there was the facility for data recording for single screen with the help of some additional hardware, but RRO is application software that records both PPI on display and MMI actions of the operator without additional hardware. It provides the functionality of recording the display output into files of 1 hour (configurable) each and replay them after selecting the files from the browser window.

2. Functional Overview

The GUI of the RRO-R application contains the following buttons:-

- DISPLAY SELECTION (user selectable)
- RECORDING START
- RECORDING STOP
- REPLAY START
- REPLAY STOP
- DROP DOWN BOX (user configurable frames per second)
- DELETE FILES
- STATUS BAR
- BACKUP
- QUIT
- VIEW LOG

NOTE:-The range for frames/sec is configurable 5-25 with default value of 15

The status bar displays the following information:-
- Recording status
- Replay status
- % Storage space left
- Information area

Typical Layout of RRO Application is shown in the following GUI:-

Figure 1: RRO-R application window

Whenever a button is selected, the particular function will start. Thus at a time either recording or replay will take place. For replay operation there is a separate **replay window**. A **Replay control window** will also open up which will contain the following functionalities:-

- Play
- Stop
- Pause/resume
- Full screen
- Browse
- Forward (seek 1 min)
- Backward (seek 1 min)
- Fast forward (seek 10 min)
- Fast backward (seek 10 min)
- Seek bar
- Status (replay time elapsed)

Note: - Whenever a cursor will hover over any icon on any of the windows there will be a tool tip showing the information about that icon.

Figure 2: Replay control window

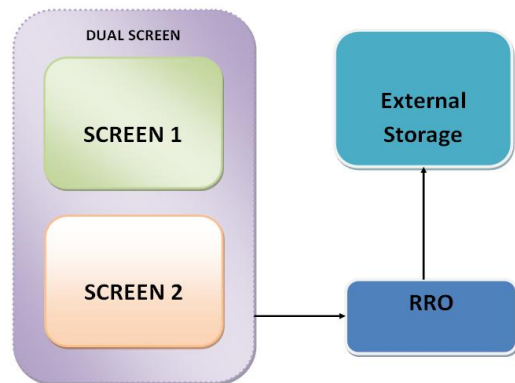*Functional architectural diagram is shown below:-*

Figure 3: Functional Architecture Diagram

Functional Specification of RRO Software

1. RRO Software has facility to record/replay dual as well as single display connected to RMCS (Radar Display).
2. During the course of operation the memory utilization (RAM) by RRO Application is minimal.
3. Icon/Shortcut on the RMCS desktop to start RRO application (or configurable)
4. Facility to record RMCS GUI (PPI) & Operator action (two different 24"display connected to RMCS with DVI Ports) and Replay for further use is available in the system. **The software can also record any type of display with any aspect ratio supported by Linux O.S.**
5. Operator is able to record the entire video session as it occurs on the display screen along with the MMI functions (with mouse movement).
6. Recording frames per second are user configurable. The default frame rate is 15 frames per second.
7. RRO Application has the basic buttons for Recording start/stop, Replay start/stop, back up, delete, view log and Quit.
8. RRO Application window has a Status area which displays the recording/replay status as well as the percent space full or left at the storage. The Information area displays the alert messages.
9. The Replay control window contains the various control buttons such as start, stop, pause/resume, forward, backward browse.

10. The full screen button displays the replay on both the screens.
11. The files are recorded in a format such that it takes least space on the storage device. This facility is for video size compression. The default format is mp4.
12. The Recorder assigns the name for the file being recorded as per current time, date. It names the file every hour. The format is:- rmcs_recording_hhmmss_ddmmyyyy. mp4
13. The Recorded file is automatically saved at RRO client/storage at hourly basis.
14. The recorded data is well catalogued and easily accessible through a suitable GUI in order to replay back the recorded file once server is in replay mode.
15. The system records in sessions in a RRO Server. The time elapsed since commencement of recording of the activities and the memory space remaining for recording is displayed along with an indication that recording is 'ON'.
16. When 95% of the space available for recording purpose gets full, a message "95% Of Available Space Is full" is generated and prompt for taking backup is generated.
17. If Replay mode is selected, **replay control window** are opened to browse/select the recorded files from storage. The replay is displayed on **replay window**.
18. Replay and recording are two mutually exclusive events so system can either be in replay or record mode.
19. While recording only Stop recording button is highlighted.
20. While replaying only stop replay button is highlighted.

3. Hardware Selection:-
Any hardware supporting RHEL 5.0 or above
RMCS: Radar Monitoring Console System
- 6U VME based Single board computer
- INTEL core i7 32NM processor SV @ 2.53 GHz, 4MB shared cache.
- Integrated two channel DDR3-1067 Memory Controller with ECC.
- GB DDR3 SDRAM soldered with ECC.
- Dual Gigabit Ethernet Interface via two INTEL 82574 Ethernet Controller

4. Salient Features:-
1 Platform – LINUX based version independent
2 User configurable frame size
3 Separate external storage
4 Recording of the displays(any type of aspect ratio)
5 User selectable display (single or dual)
6 LAN connectivity with external storage
7 Backup facility
8 Manual delete
9 Log maintenance
10. Video size compression (default mp4 format)
11. Display of percentage storage (integrated) space used
12. Visible status of recording or replay
13. Relevant Alert messages Recording and replay mode are mutually exclusive

5. Software Implementation

Softwares which are used extensively for programming are mentioned below:

1) Operating System:- Compatible on Red Hat Enterprise Linux AS 6 (64/32 bit) running on init 5 run level
2) Frontend (Graphical User Interface):- GTK version ±2.0
3) Backend:- Perl and C language

6. Conclusion
The application enables the user to maintain a record of strategic actions on the radar display and capture the frames of important track and plot information which can prove highly useful in the long run. Since the session files are stored according to date and time, they can be easily fetched from the sorted list and can be replayed whenever needed.
This helps the user to view any of the recorded files in future and reach to some strategic conclusion which may be of confidential and strategic information. It can also be used for guiding as well as operator training purposes. RRO can also be realized as tool for analysis and record maintenance purposes.

7. References

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