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SHORT COMMUNICATION

Display For Command, Control, Communication and Intelligence System

S. Prabhu, G. Kanttaiah and K. Krishna Murthy
Defence Electronics Research Laboratory, Hyderabad -500 005

ABSTRACT

Display subsystem is an important part of command, control, communication and intelligence (C^3I) system. The display used in C^3I system for air defence should provide a panoramic view of the complete air segment under its command and control in real-time. The necessary information required for taking a quick decision should be available to the commander in easily understandable graphic format. This paper describes salient features of the display known as synthetic radar situation display (SRSD) developed by the Defence Electronics Research Laboratory (DLRL), Hyderabad, for such applications.

1. INTRODUCTION

In modern warfare, the role of commander of an area air defence system is highly demanding. He must be able to command and control his resources synergitically and optimally. He has to take quick decisions and issue commands swiftly to remotely located places. Hence, an automatic data processing facility with an information display system is essential for him.

The Defence Electronics Research Laboratory (DLRL), Hyderabad, has developed a high resolution graphic display called synthetic radar situation display (SRSD), which can be fitted to a mobile land-based system. This display is connected to a host computer for data transfer through parallel DMA interface using DR11W-C bus protocol. The display is used in command, control, communication and intelligence (C^3I) system of missile batteries deployed for air defence applications.

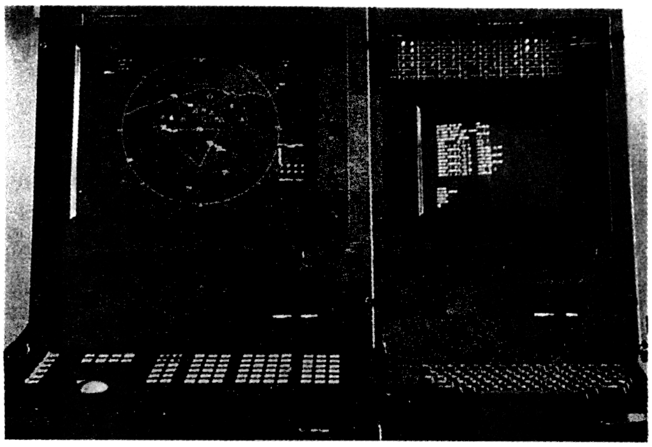

Figure 1. Display System

2. SYNTHETIC RADAR SITUATION DISPLAY

SRSD, as shown in Fig 1, is an intelligent microprocessor-based system. It utilises distributed processing concepts and raster scan technology to

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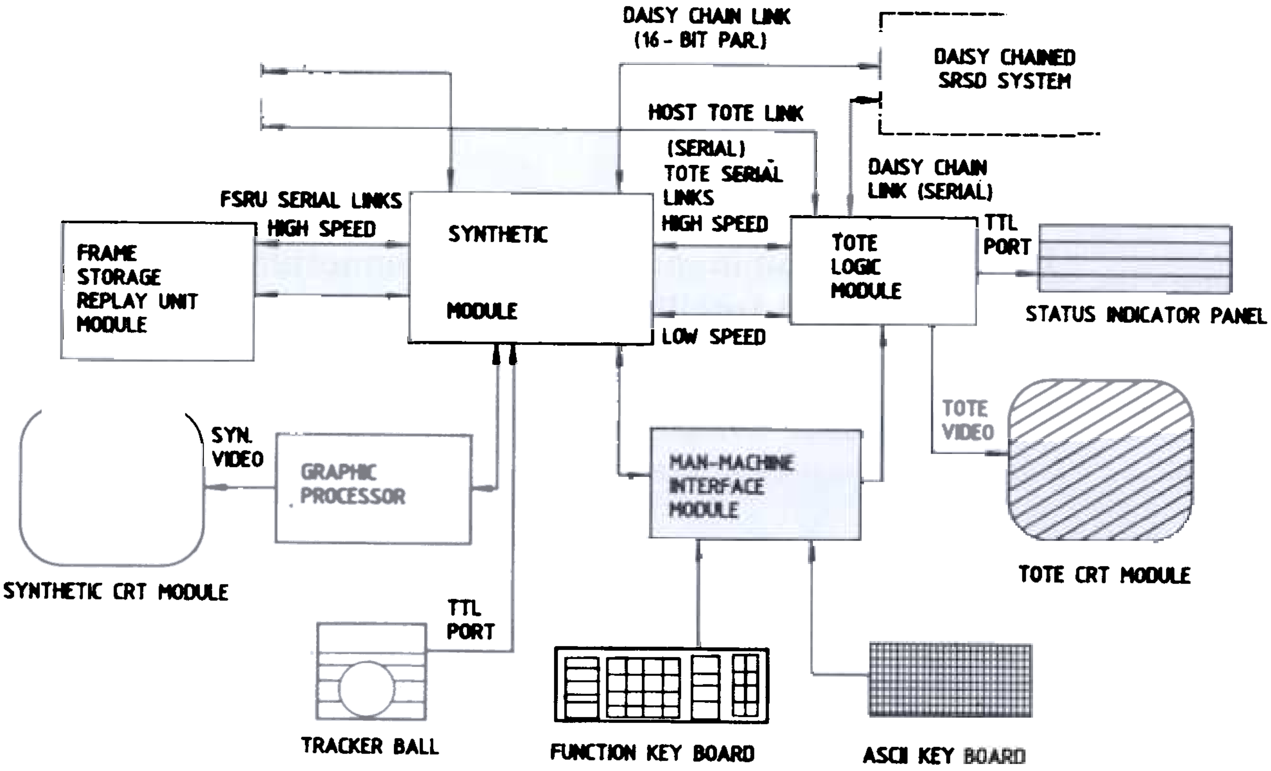

display tactical information of air targets in synthetic and Tote formats. The system receives pertinent tactical data (in the form of data files) at 1 s intervals, which it processes for display in the required formats, both in colour graphics form in the synthetic display unit and in tabular form in monochrome display unit called Tote. The console operator interacts with the system through function keyboard, ASCII keyboard and tracker ball. The major functional modules, as described in the block diagram (Fig 2.) are as follows:

2.1 Synthetic Logic & Graphic Processor Modules

The synthetic module is configured around Intel's 80286 microprocessor supported by an 80287 numeric coprocessor. The synthetic module receives 16-bit data (in the form of data files) from the system's host computer at 1 s intervals. This data is processed and is stored in the track data structures and is later displayed on the colour monitor. The synthetic processor generates new display files every second and transmits them to the graphics processor for picture generation in 16-bit parallel format under DMA control.

2.2 Tote Logic & Display Modules

The Tote processing module is configured around Intel's 8086 microprocessor supported by an 8087 numeric coprocessor. It receives 16-bit data from the system's synthetic module at 1 s intervals, and processes the data and displays it in tabular form on the Tote screen.

2.3 Frame Storage & Replay Unit

The frame storage and replay unit (FSRU) facilitates storage of up to 50 display frames and up to 10 terrain environment maps.

2.4 Man-Machine Interface Module

The man-machine interface (MMI) module facilitates interaction of the operator with SRSD system through function and ASCII keyboards.

3. SALIENT FEATURES

The radar track data are displayed on the colour graphic monitor with synthetic symbols, velocity vectors and track data table. The track data table contains three lines of alphanumeric information. The target data are updated every second. The system can handle more than 100 tracks with labels and velocity vectors attached to them. There is a provision to attach priority level to the tracks. Frame storage facility provided in the system can handle up to 50 display frames, which can be retrieved later for analysis. For closer scrutiny of the targets, zooming facility is provided. The azimuth and range markers afford easy identification of the targets. A set of 10 location maps of different areas and deployment patterns can be stored in the display. These maps can be recalled to serve as background information on the display. The Tote display module displays the track information in alphanumeric form in tabular format. The operator can recall the information, such as friendly/hostile/unknown track file, etc. An LED display panel provided on the Tote display gives the maintenance status of various weapons under its control. There is provision for 'daisy chaining' of up to 8 identical displays.

4. EQUIPMENT STATUS

The equipment has been designed for mobile applications and two such systems have already been evaluated and subjected to environmental tests. EMI/EMC tests have been conducted on the display. Two systems have been interfaced with the host computer. The integrated system has been evaluated by interfacing with the radar data processing unit of a multifunction radar through digital radio link. Field trials have been successfully conducted with high speed air targets and commercial flights.

5. CONCLUSION

SRSD display module provides the commander a fast decision capability. In the emerging hi-tech war scenario, the comprehensive display system enables the commander to efficiently utilise the resources available to him.

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Contributors

Mr S Prabhu obtained his MSc (Physics) from Banaras Hindu University in 1968 and MTech (Electromagnetics) from Indian Institute of Technology, Kanpur, in 1989. He joined Defence Research & Development Organisation at the Institute of Armament Technology, Pune, in 1970. Since 1973, he has been working at the Defence Electronics Research Laboratory (DLRL), Hyderabad, in the design, development and evaluation of electronics warfare (EW) equipment in communication frequency bands. He has developed many broadband antennas. During 1989-96, he was involved in the development, integration and evaluation of C^3I system for air defence. Currently, he is engaged in the development of direction finding system based on interferometry principle. He is a member of the Institute of Electronics & Telecommunication Engineers (IETE).

Mr G Kanttaiah obtained his BE (Electronics and Communication Engineering) from Osmania University, in 1962. He joined DRDO at DLRL, Hyderabad, where he has worked on several projects, such as electronic cipher systems, secondary surveillance radars, missile and electronics warfare systems, command and control systems, etc. Presently, he is heading a wing specialised in design and development of C^3I systems. His areas of interest are computers and communication systems, C^3I systems and software quality assurance.

Mr K Krishna Murthy obtained his BE (Electronics and Communication Engineering) from Osmania University, in 1970. He joined DRDO at DLRL, Hyderabad. His contributions to important projects in the fields of V/UHF receivers, direction finding systems for electronic warfare systems, display systems, radio relay hardware for C^3I systems, missile systems are very well recognised, and he has received many awards for his specific contributions. In particular, he has developed a variety of RF filters like L-C, helical, VTF, etc. for use in receiver RF and IF stages. He is heading the RF, Systems & Display Division at DLRL. His areas of interest are V/UHF receivers, display systems for EW/ C^3I applications, system integration and software quality assurance.