

Digital Processing of Radar Video

Mao Yifan, Zhu Jie

NanTong XingDong International Airport

Abstract: The radar is widely used in the aviation transportation industry, and for the more modern digital video, digital processing of radar is more and more important, this paper makes explanation on the development of digital processing of radar video in the air.

Key words: Radar video; Digitization

Published online: 30th Nov 2017

Corresponding Author: Zhu Jie, **Email:**

644748639@qq.com

1 Introduction

Firstly, the actual radar video images have been analyzed, and then the target feature information in radar images is extracted by image processing software, and the target information is set up^[1]. Secondly, in the Visual C++ programming environment, distance trigger pulse and the bow pulse signal, and through the radar target feature information call, simulation of radar video; and radar video signal with the trigger pulse and the synthetic distance of bow, achieve the output of radar video signal. Then, the synthesis of radar video the digital signal through the PCI interface, control of high speed D/A signal processing board M2i6105 converts analog signals, as the input signal separation circuit. Thirdly, the use of a limiter circuit, a voltage comparison circuit, design of signal separation circuit, the output of M2i6105 plate and a trigger pulse pulse signal separation distance of radar video signal, the signal separation circuit provides a signal source to realize radar signal processing unit.

Lastly, The whole radar video signal simulation system is debugged, and the experimental results are verified and analyzed^[2]. Radar is an important navigational aids for aircraft. It is an

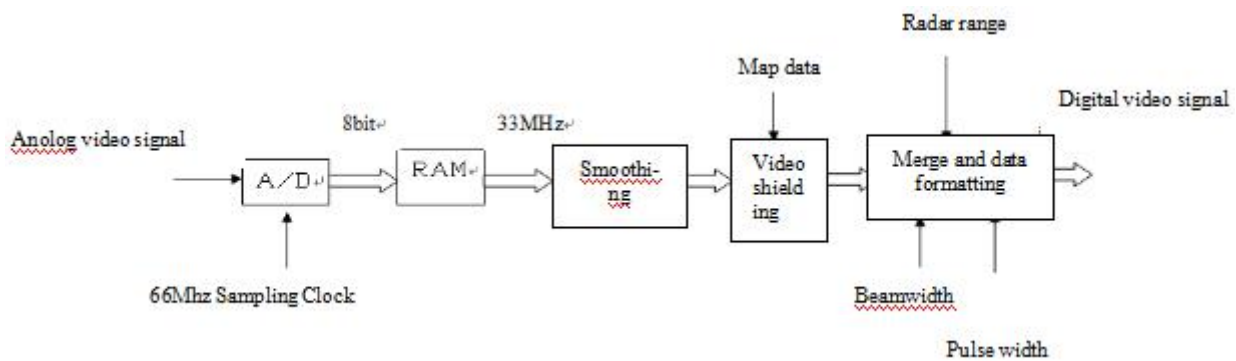
important means for pilots to navigate safely, obtain the orientation of navigation stations and the orientation of airports^[3]. The traditional radar display relates to the video signal terminal is simulated, the original radar video echo by radar visible radar receiver output, contains all the details of the target echo, echo through the receive antenna receiver through the heterodyne detection after amplification, the video amplification in PPI tube (polar type display tube) display. However, with the rapid development of science and technology, analog to digital or analog to digital conversion technology is very mature, which makes the radar analog signal digital become reality, and also makes the storage and long-distance transmission of radar video possible. The measurement of radar target position is mainly based on the time between the radar target and the radar antenna and the direction of the radar antenna^[4].

The speed of reaction is faster and the accuracy is higher. It is the technical index that modern radar pursues. Therefore, the digitization of radar video is the key to radar image information processing. With the development of modern DPS technology, radar information processing capability is guaranteed by hardware. Digital radar video is composed of radar video processor (DU Digitising, admission Unit) to complete the unit by the radar signal interface, the digital simulation of radar signal, clutter suppression, video screen and data formatting, the original digital video on the Internet transmission, digital remote control, radar remote control and state detection etc^[5].

Digital video: receive radar scan data will be sent to the DU radar data, in which signals the completion of the A / D transfer, scan conversion, target tracking, admission of

sea clutter processing and data compression. The principle

of digitizing radar signals is shown in the figure below.



From the above we can see that the scanning signal received by the radar signal simulation, simulation of radar video signal based on 66MHz sampling pulse frequency sampling, and the A / D converter is quantized into a digital video, said that video amplitude with 256 levels. The circuit can produce up to 8192 radial scan lines in each scan period of radar antenna, in each radial scanning radar line, generally take 4096 sampling points, and sent to RAM storage, namely each radial scanning line can form sampling by 4096 points. The minimum cell size is 2.27m x (1/8192 degrees). Thus, the target information contained in the radar signal can not be leaked, and the filtering of clutter and interference can be ensured accurately and reliably^[6-8].

Radar video data format: the original radar video information is very large, so it is difficult to carry out two processing and long-distance transmission in real time. Therefore, almost all systems first compress the original radar video, and then perform the two processing and transmission. Radar video compression is carried out in the process of analog video data digitization. After the clutter suppression and processing and video masking are carried out, the echo combination of digital video should be carried out. Echo merging is designed to reduce the repetition of information, adapt to radar coverage and information transmission capacity, and admit and track capacity requirements. In the radar echo video, the neighboring targets can be considered as a whole to form video patches when the detail requirements are satisfied. In video data transmission, the merged patches are the

basic unit of transmission and display, and the data parameters are the same at any point inside^[9-10]. Echo combination consists of three kinds: range combination, azimuth combination and peak combination.

2 Distance Merge

Digital video output radar digital video unit distance resolution is determined by the radar range and pulse width, pulse width for the far range, radar digital video will be merged by the basic unit to realize distance quantification, the combined range resolution from 4.5 meters to 63 meters.

3 Azimuth Combination

The principle of azimuth combination is the same as the distance combination. The general azimuth storage length is 8192, the bit merging coefficient is 1~15, and the azimuth resolution unit is from 0.044 to 0.66 degrees. The size of basic unit patches is determined by distance combining coefficient and azimuth merging coefficient.

4 Peak Combination

The peak amplitude is the merger, merger, in order to rationally adjust the sampling and radar characteristics for different reflection characteristics between targets, in echo merging processing, video for continuous sampling in the range and azimuth of the peak, average or low value and.

The purpose of data format for digital video is to reduce the amount of data as much as possible without losing the target information and to form a standardized data structure. After digitization of radar video data, it needs to be encoded in a certain format. It can be sent to the transmission line and transmitted to the display device. The display device displays radar echoes on the chart after it receives the data.

Radar video digital has provided the convenience for the target tracking, admission and integration with automatic identification system and image, comprehensive monitoring for water transportation management center provides a digital signal, but also provides a digital signal for the navigation of ship navigation radar data recorder.

Concluding remarks

With the calculation ability of PC increasing, the use of PC and radar data acquisition equipment to replace the display terminal scheme of radar display, according to the proposed radar digital video display system design. The system can realize high-speed acquisition of radar video signals, real-time video processing of radar video signals with programmable devices, and software programming to complete the functions of radar display terminals.

References

- [1] Ning Wang. Video processing and transmission technology for navigation radar, CHINA SHIP RESEARCH INSTITUTE.
- [2] Chunxu Liu. Digital display of radar image, DALIAN MARITIME UNIVERSITY.
- [3] Jun Hu. Research on radar video image acquisition and processing technology, DALIAN MARITIME UNIVERSITY.
- [4] T Ishikawa. Arithmetic apparatus with overflow correction means, US.
- [5] A Kuroda, T Matsushita, M Kobayashi. Data processing system for determining min/max in a single operation cycle as a result of a single instruction, US.
- [6] M Takahashi. High speed dividing apparatus, US.
- [7] BJ Sprague. GA Portanova Binary division of signed operands, US.
- [8] Y Okumura, T Miki, T Ohya, et al. Minimum/maximum data detector, CA.
- [9] J Curtet. Digital processing device with minimum and maximum search instructions, US.
- [10] B Blaner, DR Strouphauer. Processing system and method for minimum/maximum number determination, US.