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Study on the space burst point test system used in proximity fuze projectile

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Abstract:

Aiming at the problems of existing device in measuring the projectile proximity fuze three-dimensional coordinate of space burst point. A system based on six light-screens principle and flame detector was presented. The system's main detector includes two multi-screen sky screens and one flame detector. The six light-screens detector array is composed by six optical and photoelectric conversion parts of the two multiscreen sky screens. When the projectile passes through the six light-screens, the data acquisition instrument records the data of the analog signals produced by the sky screens. The projectile velocity V , angle of incidence θ and γ , impacting coordinates X and Y all can be got by processing the signal. The projectile's explosion time T can be detected by the flame detector. And then projectile's three-dimensional coordinate of space burst point can be calculated by above-mentioned parameter. It is proved by the experiment that the system is stable and reliable, and can meet the demand of the shooting range well.

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I Introduction

In the process of development, test, production and inspection of the proximity fuze, an important criterion that a fuze is eligible or not is a projectile with the fuze explodes or not in a range (namely, acceptable range of the proximity) of a target destroyed. If the projectile explodes in the stipulated range from the target and does not explode outside of the range, the fuze is eligible, otherwise, it is not eligible. During a test, if the location of a target destroyed is certain, just measure the 3D coordinate of the space burst point to determine the range of the explosion location from the target destroyed. Recently, there are two main methods of measuring the 3D coordinate. They are acoustic measurement and photoelectric measurement. For the acoustic measurement, some sonic transducers in a geometry array are fixed nearby a measured location, the explosion wave spreads around from the explosion location after the ammunition explodes, the times for sonic transducers receiving sound signals are different due to the different locations of the transducers. Therefore, the 3D coordinate^{[1]-[4]} of the explosion location can be calculated according to time

space burst point 3D coordinate of the proximity fuze, the method is incapable of measuring the distance that the projectile failing to explode in a predetermined plane deviates the target, and it is unable to decide that the proximity fuze is eligible or not. The third method is an explosion location measurement system^[8] with a high-precision CCD TV theodolite, the system mainly consists of a CCD camera, a electronic theodolite, a video processor, a angle transmission display and a computer, etc. The CCD camera converts optical signals into video signals transmitted to the video processor, the video signals are converted into digital signal by means of A/D conversion and image processing and transmitted to the computer, and the coordinate can be worked out in accordance with the segmentation and centroid calculation, and then the coordinate angle of the space burst point location can be obtained according to the direction and high-low index of the theodolite circle. The system is in the nature of higher measuring precision and can form a space cross network using many CCD TV theodolite measurement systems, thus, it can measure the 3D rectangular coordinates of many space burst points. However, the system is not able to measure the distance that the projectile failing to explode deviate a target in a predetermined plane. Besides, the system is complicated and expensive, which is not economical and practical. Thus, the paper presents the 3D coordinate measurement method of the projectile space burst point location based on six-screen array principle due to the problems and shortcomings of many methods mentioned above.

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