Development of multi-objective spatial position testing technology

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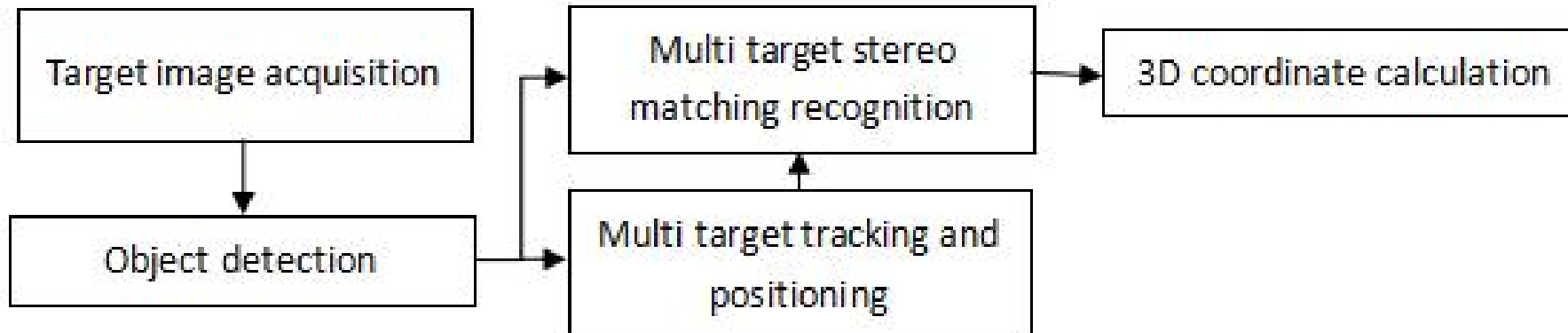Jilin, Non commissioned Officer School of the Army Armored Corps Academy , China.

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Introduction

At present, the main methods for multi object detection and localization include manual measurement, image-based object detection and localization, and non image-based object detection and localization. Non image based object detection and localization methods mainly rely on radar detection technology, laser detection technology, and sound localization method to achieve object detection and localization; The latter mainly relies on image processing technology to achieve target detection and localization, commonly used methods include frame difference method, background subtraction method, and optical flow method. Radar has been widely used in both military and civilian fields, but it has high tracking accuracy when tracking targets with long distances and large volumes, and low tracking accuracy or even inability to track targets with short distances and small volumes.
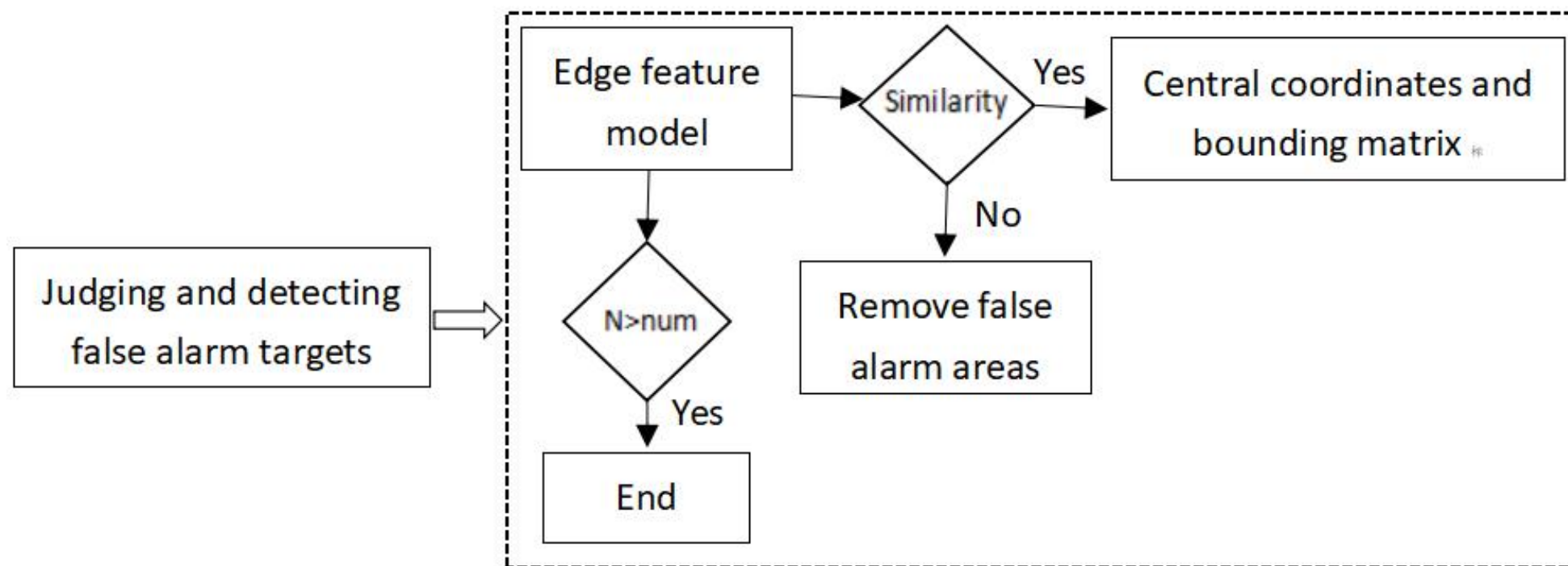
Methods

1.1. System composition and functions

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┌─────────────────────────┐        ┌─────────────────────────┐        ┌─────────────────────────┐
│ Target image acquisition│───┐    │   Multi target stereo   │──────▶ │ 3D coordinate calculation│
└─────────────────────────┘   │    │  matching recognition   │        └─────────────────────────┘
             │                 │    └─────────────────────────┘
             ▼                 │                 ▲
┌─────────────────────────┐   │    ┌─────────────────────────┐
│    Object detection     │───┴──▶ │ Multi target tracking and│
└─────────────────────────┘        │      positioning        │
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Methods

1.2.System Overall Research and Design Methods

Specification parameters	Index
Resolution @ frame rate	1936×1464@409FPS
Sensitivity	1677mV1/30s
Frame cache	256M Bytes
Maximum gain	125
Pixel size	4.5um×4.5um
Pixel depth	12bit

Methods

1.3. Methodsthe Algorithm implementation

Results And Discussion

The non detection based multi object tracking method requires manual annotation of objects of interest in the first frame of the video image sequence, initialization of data parameters, and tracking of annotated objects in the rest of the video. By using methods such as Kalman filtering, particle filtering, or mean filtering to predict the possible position of the target in the next frame, and then comparing and associating the predicted position with the actual position of the target, multi-target tracking is achieved.

Image sequence → Target detector → Target association → Multi target tracking