

USING IMAGE PROCESSING TECHNIQUES FOR ESTIMATING ROCKET TIP-OFF

VERTICAL:
AEROSPACE & DEFENCE

SERVICE:
**ENGG. SOFTWARE
DEVELOPMENT**

TECHNOLOGY:
CONTROLS & DYNAMICS

Our customer is a defense organization working towards delivering state of the art Multi Barrel Rocket Launch system to Indian Army. Such systems suffer from *tip-off*, i.e. non alignment of the projectile with the launch tube at the time when projectile has just left the tube. Since tip-off affects the *fall of shot* and *CEP* (Circular Error of Probability), its measurement from every launch trial is extremely desirable. Even though high speed cameras (1000 fps) are being used to document the launch, manual analysis on underlying images is error prone due to distortions from lens aberration, CCD/CMOS noise, lossy image compression algorithm etc.

Zeus Numerix developed a generic software framework involving computer vision and image processing concepts. The software comprised mainly of:

- Calibration (transform from optical characteristic & orientation),
- Lens Distortion (modeling of radially symmetric distortions),
- Shooting Setup (selection of video frame composition),
- Image Processing (tracking algo for projectile translation / rotation)
- Kalman Filter (analysis with dynamics equation).

The measured tip-off values from this software were in excellent agreement with numerically estimated value & its effect of *fall of shot*.

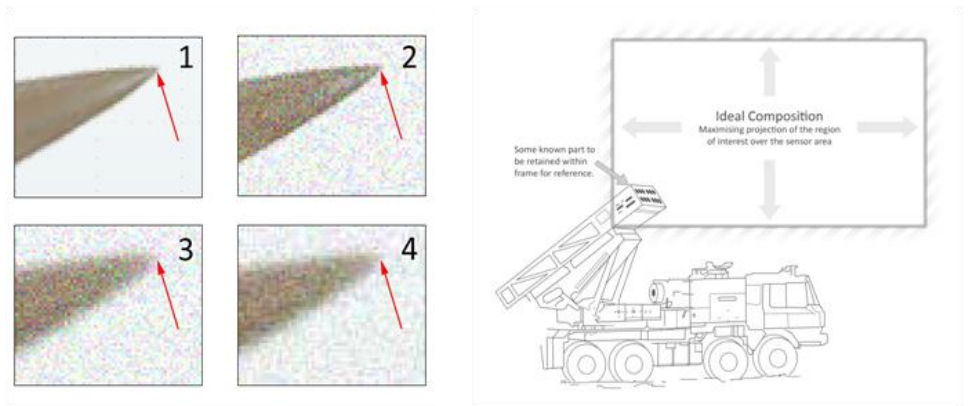


Figure 21: Image processing for analysis of rocket flight

Customer was supplied with this software which automated the process of rocket launch measurement. Extracted data is presented in easy to analyze tables / graphical plots, thus saving the designers of rocket system a lot of precious time.