

## Automatic digitization of war games map situations via marker detection

War games are a military education tool where officers move their units on a map, simulate battles with dice rolls or other means, taking in consideration terrain and other aspects. Military would like to digitize the flow of the game, to later analyze, find mistakes, learn.

This proof of concept study would demonstrate if and in what limits it is possible to automatically detect game pieces representing military units on a big map. Game pieces can be labeled with specific identifying markers, but they are small with respect to the game board (map), hence represented by only a limited number of pixels on an image of the entire map. When labeling pieces with a marker, such as ArUco code, the piece identity must remain understandable to human as well.



ArUco 42



ArUco 18



ArUco 27



ArUco 43

The student is expected to:

- Design pieces that contain computer-readable marker, as well as human readable symbol.
- Choose photographing methods - either one photo of the entire game board (map) or multiple photos (implement merging detection on multiple images reliably). Choose device to photograph with (is 40megapixel image from a phone enough? What are alternatives?)
- Investigate which size the markers must be in terms of pixels per side to be successfully detected on the colorful background of the map.
- Investigate if some types of markers are more effective than the most common ArUco marker?

The work would be done in collaboration with the Military Academy. There will probably be no restrictions for non-NATO member citizens as this is an exploratory study.