ASSIGNMENT 2 - Feasibility Study

GROUP MEMBERS

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INTRODUCTION

1.1 This study was conducted to determine the feasibility of the ARES (Augmented-Reality Environment Tactical Scanner) system. The study finds its basis in historical research and private consultations from real-world NATO military personnel of high ranks. A descriptive survey was conducted beforehand, in which a previous draft of the document was provided to said personnel, ranking from Lieutenant-Colonel to 2-Star Generals, who were sourced from personal networking. As the initial prototype is already available, the team has decided to proceed with its continued development and further refinement of ARES' algorithms and data-models.

BACKGROUND

2.1 The rapid advancements in technology to a more digital-oriented environment had resulted in unexpected evolutions in all aspects of human society, including the field of warfare. The post-2010 years had seen an increase in the trend of weapon-system automation and electronic warfare, as well as a renewed interest in the deployment of military robotics. A number of these state-of-the-art systems had been implemented into military units at a brigade or division-level either for testing prototypes or direct usage from mass-production lines.

2.2 The US Armed Forces, in particular, have experienced a shift toward the centralization of its command structure, mobilization of mechanized infantry carrying lighter equipment, and the enhancement of their performances through integrated digital electronics such as smart computer technology and stealth-based capabilities. This is highlighted with the public release of the first iterations of F-35 jet fighters for the Air Force, directed-energy weapons and responsive fire-control for the Navy's point-defense guns, and the IVAS heads-up display mod for Army and Marine helmets.

Gambar 1.1 | "*Integrated Visual Augmentation System*"
(IVAS_api.army.mil, 2020)

2.3 The Augmented-Reality Environment Tactical Scanner, dubbed ARES, seeks to join the fray. It is an augmented reality-based expert system that analyzes and identifies potential hostiles (OPFOR) based on a number of external factors to cross-check with an internal database. Said factors include, but are not limited to, national identity, military / paramilitary equipment, and weaponry type using shape detection, body scanning, and precise geopositioning.

The device runs on Raspberry Pi 4 [Model B], a rather simple and affordable computer with substantial computing power. Compact yet modular in design, its allows for many usages; they cater to a cost-effective solution in personal computer design. However, its underlying potential and proven utilization in the field of robotics is the characteristic that is highly sought after by the team.

REQUIREMENTS

3.1 Designing an augmented-reality device, let alone one for military applications, requires careful planning and construction with substantial resources. The culmination of this process is a functioning prototype and the basic device specifications regarding both its hardware and software. As agreed upon by our sponsor in the contract, the team had been provided with approximately IDR 10.000.000 to fund the creation of this device towards the prototype stage.

3.2 The requirements for the project are listed as follows:

- System will ask for the user to search for potential targets
- System will perform a full body scan on LIVE image or video
- System will display / output information regarding national identity, equipment and weaponry type, and corresponding threat level of target
- System can give an option to tag and track targets based on geolocation

3.3 Budget Plan Table

No	**Expenditure Type**	**Costs (IDR)**
1	Rental services, manufacture of third-party products, etc.	1.250.000
2	Consumables; internet quota, papers, hardware / software etc.	1.697.000
3	Logistics and transportation	780,000
4	Others; publication, app hosting and domain etc.	2.138.810
5	**Total**	**5.965.810**

EVALUATION

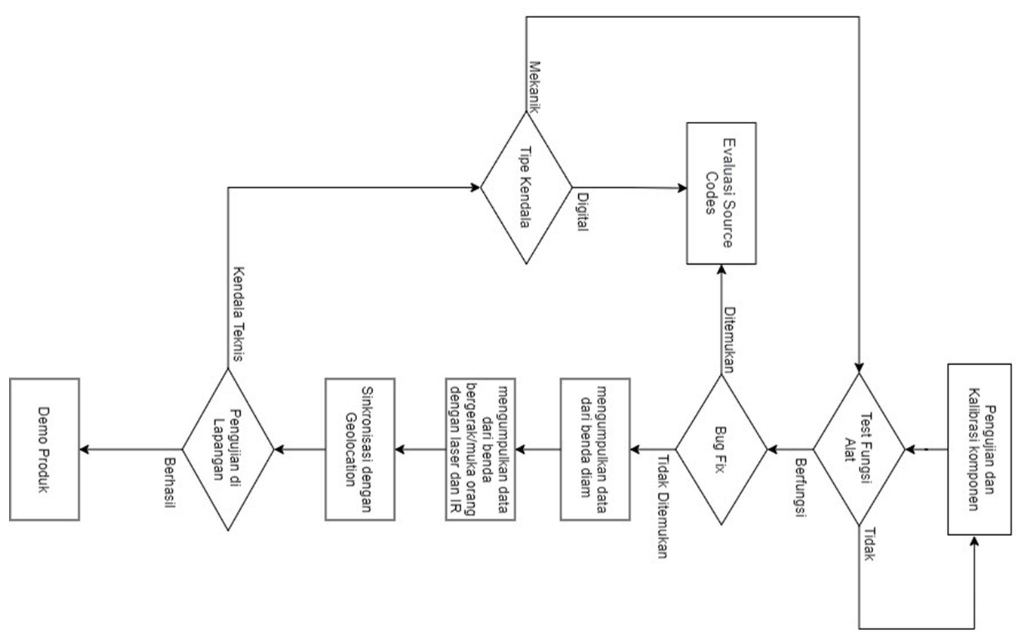
4.1 Achieving the previous section’s requirements calls for a collection of methodologies to be conducted directly with the device. This will be to prevent errors during deployment via unit testing, and should it happen, mitigate any loss that will occur.

An example of one such methodology for the requirement is as follows:

4.2 Unit testing will be carried out so that the team can analyze the structure of the device, unit-by-unit, for any missing or incompatible parts. The team will review the status of the program coded into the device to detect potential bugs or errors in basic programming. If no errors occur during the first dozen stages of operation, the team may proceed with field testing to collect datasets. Data can initially be collected from the environment and inanimate objects, Integrated pattern or facial recognition algorithms will be tested simultaneously to identify people and mark them via the IR laser. We will then enable the device to synchronize with the GPS to both external networks and API. This test will serve to pinpoint coordinates and plot vectors of varying variables on a digital map application to be displayed on the head-up-display (HUD) or GUI. This will be done within city limits, all in semi-private areas which will be largely empty to refine the process.

The final or post-test must be carried out with living things to perform calculations on dynamic or motion; i.e. planning a trajectory, course, or arc. Once everything has been set up, the team must ensure and/or confirm that all functions are compatible with each other.

4.3 Diagram of the unit testing:



Gambar 3.1 | “*Flowchart for the Evaluation Process: ARES*”

CONCLUSION

5.1 Thus, it is possible to fill most, if not all, of the requirements presented in Section 3.

This study had also shown that modern militaries had already begun research and development on similar systems, such as the US Armed Forces' IVAS (Integrated Visual Augmentation System) or the Russian Army's RATNIK integrated exoskeleton rig.

This indicated that the manufacture and completion of the device, particularly its prototype, is definitely within the realm of possibility. In fact, it had been done, albeit nearly complete and untested. As the initial prototype is already available, the team has decided to proceed with its continued development and further refinement of ARES' algorithms and data-models.