

Human Factors Implications of Highway Pavement Inspection and Mowing Operations Tasks Using Unmanned Aerial Systems

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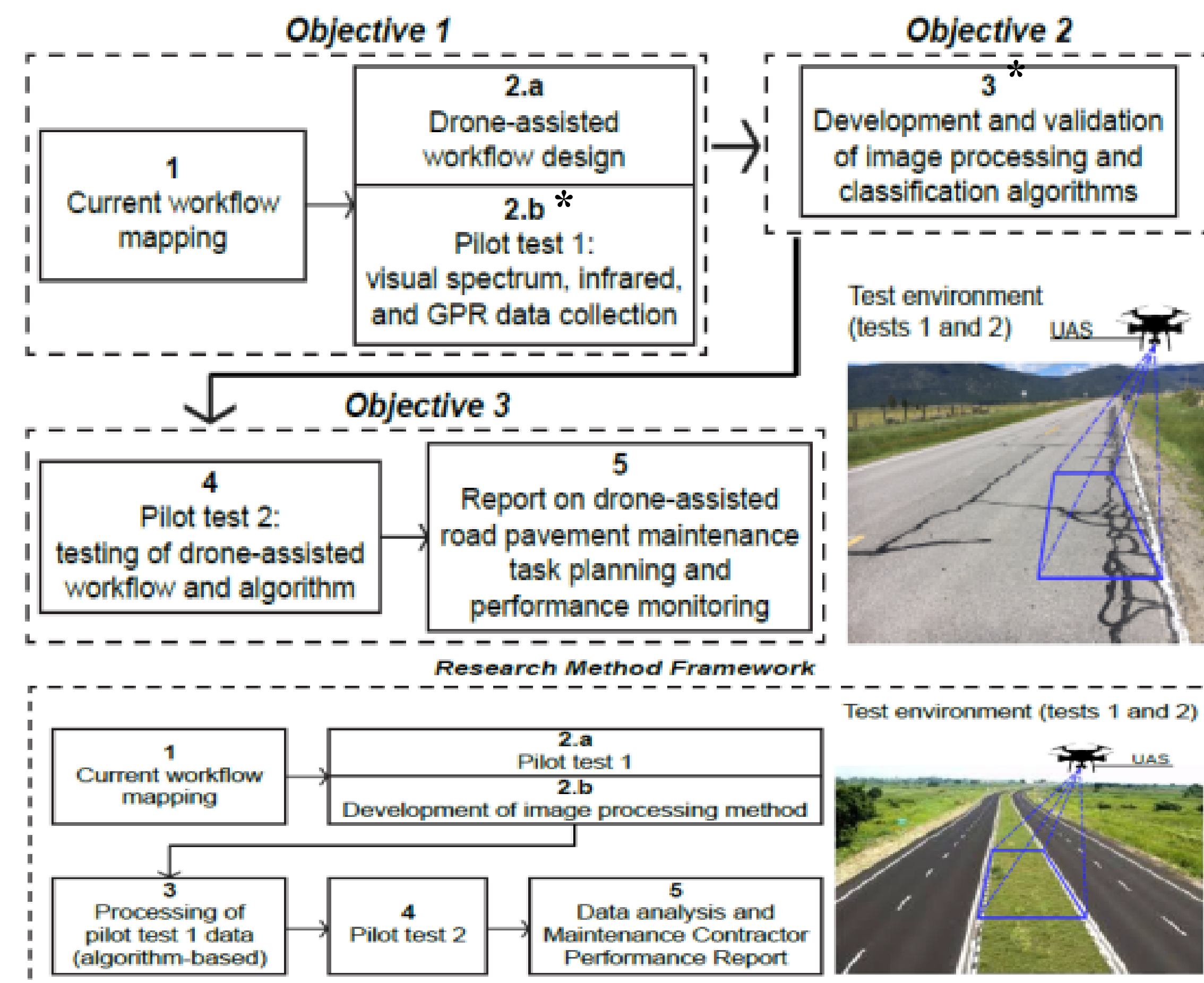
Research Objective & Overall Framework

Monitoring and performance verification activities of roadway maintenance tasks are labor-intensive and prone to error. The adoption of Unmanned Aerial System (UAS) technologies provide an opportunity to improve upon these tasks. An essential aspect of deployment of UAS technology is workflow design. Consideration of human factors in workflow design is integral to obtaining acceptance by intended users. Human factors aspects of workflow design are central to safe human-UAS teaming[1]. These considerations include workload, situational awareness, and the ability to overcome technology failure. Human performance has been shown to be highly dependent on workflow considerations [2]. Workflow design must, therefore, consider possible human errors and prevent losses from over-trust in automation and subsequent degradation of situational awareness and direct control of the system. This research is focused on human factors aspects of the design of workflow tasks for deployment of UAS by DOTs to perform pavement inspection and right-of-way post mowing inspection tasks.

Conclusion and Future Work

Existing workflow tasks are being redesigned to accommodate the use of drones to address challenges with the current methods of task verification, such as collecting data over long distances and dangerous traffic conditions. Human factors related considerations are being identified and documented. The result will be a workflow that considers the needs of all stakeholders. The research conducted under this study will further the knowledge of human factors considerations in UAS workflow design for pavement and right-of-way inspection tasks. It is anticipated that the development of UAS highway inspection workflows, which are highly sensitive to human factors considerations, will lead to expanded applications of drone technology within transportation departments.

Methodology



Initially, interviews of DOT state and district maintenance management were conducted by online conversations due to the COVID-19 pandemic. This initial stage enabled mapping of the current workflow for mowing tasks. Human factors considerations of each task were noted and analyzed based on impact to safety and accuracy of the mission. Next, a revised workflow will be designed and mapped, which incorporates the new UAS technology. Each task in this new workflow will optimize human factors considerations. Finally, experimental field tests will be conducted for selected tasks. Pilot tests will be performed in cooperation with the State DOT to collect data employing the revised workflow to confirm the beneficial design.

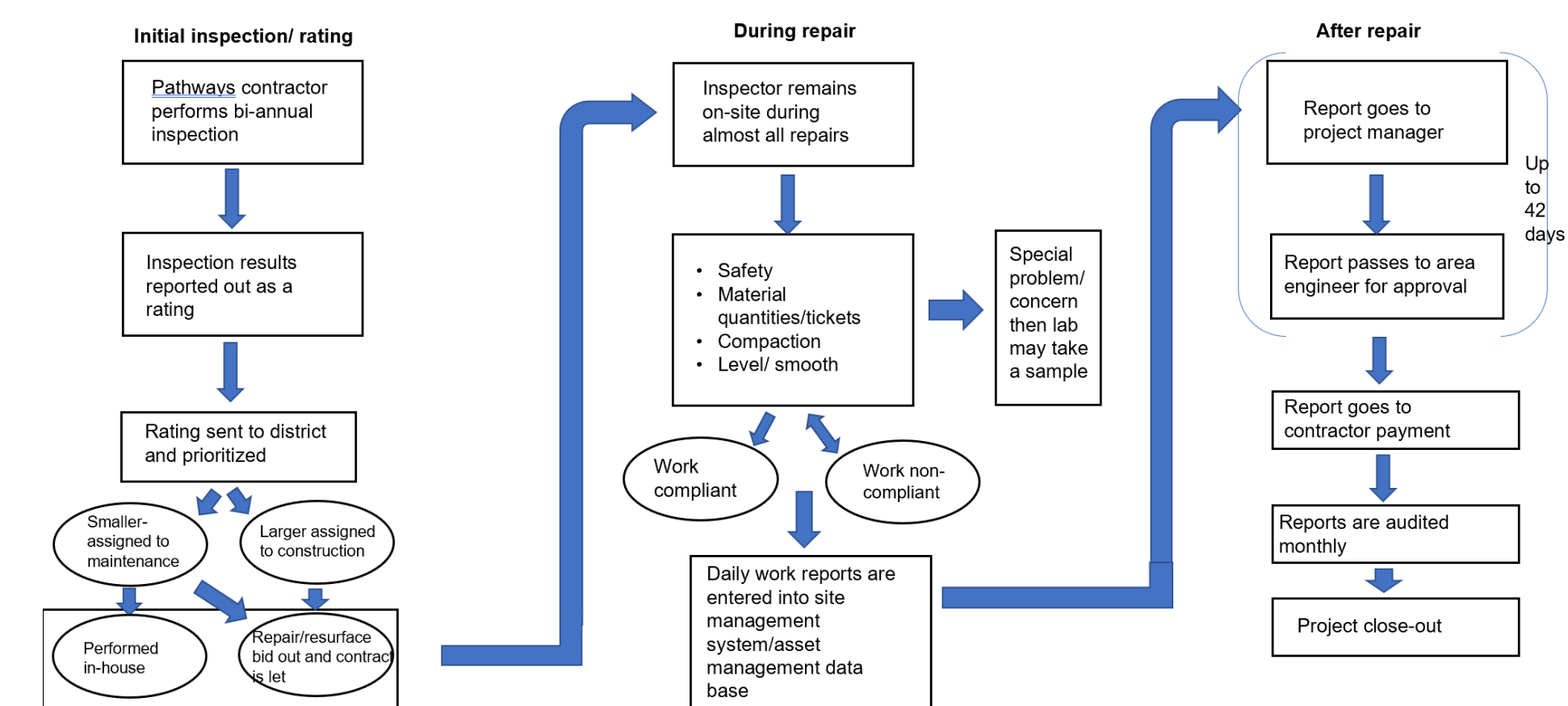
* These two tasks are not part of the human factors analysis and design portion of the project.

References

- [1] Alami et al., 2006; Hoffman and Breazeal, 2007; Kwon and Suh, 2012; Lasota and Shah, 2015.
- [2] Parasuraman et al., 2008; Stanton and Young, 2011; Wickens, 2008.

Current Workflows-

Pavement Inspection



Mowing inspection

