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| Project Title | Robotics and Automation in ABC Projects: Exploratory Phase |
| University | FIU |
| Principal Investigator | Mantawy, Islam Azizinamini, Atorod |
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| Funding Source(s) and Amounts Provided (by each agency or organization) | ABC-UTC Funds: \$100,000 FIU Match Funds: \$50,000 |
| Total Project Cost | Total Funds: \$150,000 |
| Agency ID or Contract Number | Accelerated Bridge Construction University Transportation Center (ABC-UTC) 69A3551747121 |
| Start and End Dates | 03/01/2019– 09/30/2020 |
| Brief Description of Research Project | The majority of bridge elements (such as full-depth deck panels, superstructure girders, bent caps, and columns) are prefabricated in a controlled environment, therefore, they are qualified to be constructed through automated process such as 3D-printing or contour crafting (CC) using mobile robots. In addition, in-suit construction activities associated with ABC (such as connections between prefabricated elements, repairing damaged elements, and upgrading existing substructure elements) are candidates for automated construction through the use of mobile robots. The advances in robotics and automation in construction industry is not comparable to the advances in other sectors such as automobile, aircraft, electronics, etc. because, the current conventional construction and design approaches are not suitable for automation; lower ratio of production of final projects as compared to other industries; and limitation in materials that could be employed by automation. Since ABC projects utilize prefabricated elements and in-suit connections between prefabricated elements through nozzle injection and employed materials, Automation and Robotics are qualified for ABC. This proposal suggests feasibility studies for types of robots and systems, suitable for ABC along with identifying the suitable materials, ABC elements and connections which are used in automation process. Several advantages can be achieved by integrating automation and robotics with ABC techniques including increasing construction quality and reducing accident rate at construction sites. This study will be limited to feasibility |

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| | <p>investigation. The main objectives of this project are:</p> <ul style="list-style-type: none"> • Conduct a comprehensive search to identify the application of robotic in construction worldwide. • Identifying the list of robots, materials, ABC elements, and ABC in-suit connections which are suitable to be used in automation of ABC projects. • Develop a roadmap for application of robotic in ABC. |
| Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here | Based on Atorod's presentation during Nov-19 TRB 1st International Conference on 3D Printing and Transportation, Army Corps of Engineers contacted ABC-UTC to submit an idea proposal for use of this technology for military construction. |
| Impacts/Benefits of Implementation (actual, not anticipated) | Approached by NASA to be part of research project for Artemis |
| Web Links <ul style="list-style-type: none"> • Reports • Project website | https://abc-utc.fiu.edu/research-projects/fiu-research-projects/robotics-and-automation-in-abc-projects-exploratory-phase/ |