Developing a 3D Modeling Application Based on a Bezier Surface Reconstruction Algorithm for the Rebuilding of Natural Disaster and War Damaged Areas

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One of the most significant problems following natural disasters and wars is finding a way to cheaply and efficiently rebuild damaged structures. Laser scanners have often been used in the past for such renovations but are expensive and inaccessible in developing regions. In this research, an android 3D modeling application was developed that creates high-quality scans of damaged buildings, providing the necessary information to determine the causation, scope of damage, and structure of the buildings in order to design more accurate and cost-efficient repairs. With the increasing abundance of smartphones, this alternative to laser scanning is low-cost, accessible, and efficient, especially with its drone compatibility. The application consists of three main features: a building scanner, an aerial building classifier, and a 3D model generator. The core of the application is the building scanner that utilizes a five-step process to generate high-quality 3D models of any structure, replacing the scans from laser technology. This process includes a Bezier low-density surface reconstruction algorithm, which decreased the percent error of reconstruction by 3.3% from previous leading methods. The second feature of the application is the aerial building classifier, which identifies buildings from an aerial drone view, classifies the buildings based on the extent of damage, and constructs an interactive map of the buildings, in which the data from the building scanner feature can be stored. The final feature allows the user to take images and create a 3D model of any object for 3D printing purposes. Through these features and the reconstruction algorithm, this application lowers the cost and increases the accessibility, efficiency, and accuracy of building repairs.

Awards Won:
Oracle Academy: Award of $5,000 for outstanding project in the systems software category.
Shanghai STEM Cloud Center: STEMCloud Award of $1800 in Chemistry