



An Augmented Reality (AR) ToolKit for Ukraine Damage and Repair in the War-Ravaged Country

Stages and Definitions:

Stage 1 - Drone. Any unmanned aircraft that is guided remotely or radio-controlled.

Stage 2 - Walk and Fly Animation with AutoCAD. With building specifications, you can create an animation including walking and/or fly-through a drawing.

Stage 3 - 'Augmented Reality (AR). Overlaying visual, auditory, or other sensory information onto the real world to enhance one's experience; augmented reality adds to the existing world as it is.'

Stage 4 - 3D Printer. A machine allows the creation of a physical object from a three-dimensional digital model, typically by laying down many thin stages of a material in succession.

Stage 5 - Recording for YouTube. Sharing the AR Mission #1 journey or assemblage as a movie.

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Joseph is kicking debris out of his way with his first breaths of fresh air since the Russian Army left the region yesterday. Baby toys, nuts and bolts, bomb dust and soda cans litter his path to the University. As he surveys the damage to residential and commercial buildings, he is contemplating rebuilding the many semi-destroyed apartment buildings here. He carries his drone and a backpack full of flight technologies to meet with his Graduate School friends. They gather in an unbombed section of the school that miraculously has electricity.

Big hugs fill the space.

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The drone is ready for AR Mission #1. Battery powered. Remote control for inspection. Using a visual mapping app, the aerial machine is programmed to survey building #1. The façade of the 18th story apartment building has been blown off by Russian shells and ample repairs are needed. The drone captures both still and video images that will serve as technical and creative base information for the AutoCAD, AR and 3D printing stages that follow.

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The drone's information, having harvested the building's war-provoked data, is downloaded into a waiting laptop for parsing and visualization. The next stage, using AutoCAD tools, is to transform the raw data from the flight into usable building specifications to determine what remains and what is missing. The AutoCAD produces an animated, 3D fly-through video of the

inside and outside of the target building for a more detailed specification set. The 3D fly-through animation video is the media for Augmented Reality or AR.

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The students strap on their AR headsets and gloves and set out to combine the fly-through video with computer graphics from the AR software. The work appears to be in real-time although it isn't. A text stream ribbon is placed at the bottom of their shared screen showing building specifications. A hyper, shared reality is born.

The renovation team debates, then fixes, the building through the magic of AR. A new facade and furnishings are created and inserted in the building along with a new play area for the kids. The group co-creates the simulation like explorers entering a new world.

They request and receive a detailed cost estimate for building repairs from the AR-generated computer. AR Mission #1 is created!

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A 3D Printer creates a scaled mock-up of the renovated building; a three-dimensional digital model that synthesizes the AutoCAD data with the AR movie from today's work.

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Last task – the team saves and posts the final video assemblage as a movie file for ongoing post-war research with government and university colleagues through their Youtube channel. Final video formats can be .AVI or .MP4.

A post-war Collective Dream rises in Ukraine with interactive technologies, and hopeful hearts, for a new homeland!

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