AR Lego Instructions

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Task description

Assembling complex objects often requires looking up instructions in a manual. However, picking up a printed manual, or a tablet with a digital manual, interrupts the assembly procedure and may require to put aside tools or materials.

Ideally, work instructions should always be available on-demand within the field of view without requiring the users hands. And to explore augmented reality (AR) based working instructions, this project aims to visualize AR build instructions for LEGO sets.

The LDraw (https://www.ldraw.org/) project defines an open standard for LEGO CAD models (https://www.ldraw.org/article/218.html) and also offers a database of many LEGO parts (https://www.ldraw.org/article/13.html) and complete models (http://omr.ldraw.org/).

The task of this project is to compute the geometry of different build steps of a LEGO model, either brick-by-brick or by using step definitions from the CAD files, and to define an AR user interface to visualize these build steps, as shown in the mockup in Figure 1.

Figure 1: Mockup of AR visualization of a LEGO model

The user interface should enable the user to inspect the target model of the current build step, with new bricks highlighted, and to switch between build steps. To inspect the model, the user will be able to position the 3D target geometry within the real world environment and to rotate and scale the model as needed.

Additional resources

Based on the LDraw specification and parts database, several other tools are available, e.g.

- https://www.mecabricks.com
  Online LEGO build/design tool. Has internal geometry representation for many parts. The modeling tool loads the geometry from URLs like https://www.mecabricks.com/assets/parts/json/3002.json for part 3002.
- https://github.com/TobyLobster/ImportLDraw
  Blender importer for LDraw files. Imports complete models, not single build steps.