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GENERATE AUGMENTED TRAINING OF PHYSICAL OBJECTS

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Generate augmented training data of physical objects

This idea describes a method to generate training data of physical objects using simulated 3D models to help generate more robust object classification machine learning models.

Technologies to enable scanning and identifying 3D objects is very important for businesses of the future. For example, a hardware store may need to scan and identify an old object to find a similar newer object. This search process is generally aided using deep learning algorithms. However, deep learning systems need a lot of training data to help in the search process. If the system is trained using only new and full objects, the system will not be able to identify a broken part. And it is very hard to find training data of such broken parts.

To help generate more training data of broken parts, we are proposing the method below.

1. The system needs to be provided with 3D models of physical parts.
2. The system generates a modified/broken part of a physical part using one or more of the methods below.
    a. The system may randomly edit the 3D part by adding in holes, cracks, bends or other deformities into the 3D part.
    b. The system may identify joints in the 3D part and detach them (for example, disjoint parts of a wrench).
    c. The system may try to simulate using the part if such data is available using a physics engine. (for example, using a tire may wear it out in a simulated physics engine.)
3. In the above step of the simulation, the system may use historical data of how the part gets damaged from in-store scans or reviews provided by users. For example, the system may find from reviews a specific pipe always gets broken in half. So, for that, the system would only simulate a broken pipe of different angles and shapes, but not add holes in it.
4. Finally, the image of the 3D part is passed to the ML training system.

The biggest advantage of this system is a significant improvement in the accuracy of the neural network without the need of acquiring real-world data on the broken parts.

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