***Video-to-3D Models***

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**Application**

1. Medical Imaging: Existing media of body parts or procedures can be converted to 3D models for medical training for students or professionals and documenting better versions of existing procedures.
2. E-commerce: 3D modeling can benefit e-commerce companies by improving product visualization because this allows customers to view and interact with products in 3D. Customers can then compare those products with others in terms of size or other parameters.
3. Entertainment and Gaming: In animation, video footage can be converted into 3D models. The realism of animated movies and video games can be improved by using actor video footage to create 3D characters.
4. Sports: Similar to the Decision Review System(DRS) in cricket which is used to check for potential leg before wicket, live video recordings of sporting events can be analyzed for decisions. It could also be used by coaches to improve the techniques and performance of athletes.
5. Geospatial Mapping: Aerial or satellite videos can be converted into 3D terrain models for example, videos of disaster affected areas can be converted into 3D representations, for faster response and relief planning.

**Problem Statement**

Existing models and methods for video-to-3D modeling require specialized software and knowledge as well as requiring a lot of work and often lacks speed and accuracy. This limits the number of users being small. The presence of a new system which would be standardized and more user friendly capable of handling various video outputs would make 3D modeling more accessible to a wider user base and open a whole new set of opportunities.

**Impact**

1. Efficiency: The 3D modeling automation from video can save significant time and resources, making it accessible to a wider range of applications resulting in a more rapid project completion and less resource usage.
2. Accuracy: The system should make 3D models more accurate, increasing accuracy. This improved precision will come in very handy for applications where precision and detail are crucial.
3. Cost Reduction: Manuel production of 3D models can be expensive. Automating the procedure reduces the expense making 3D modeling more cost-efficient for industries.
4. Innovation: Simplifying the process of converting video to 3D models will drive innovation in multiple fields providing faster, more accurate outputs that are pivotal in industries.

Making 3D models would be simpler and more economical, opening up new opportunities for product creation, special effects, virtual reality, and medical imaging.

**Expected Outcome**

The expected outcome of this project is the creation of a practical and effective system that accepts video input and generates precise 3D models of the captured objects.

* Be able to accept a variety of video formats and resolutions.
* Create 3D models that are compatible with widely used 3D modeling softwares.
* Decrease the amount of time and manual labor needed for 3D modeling.
* Create a user interface to facilitate user interaction and integration.

**Prototype**

Converting videos to 3D models is a complex process that requires specialized software and knowledge. However, there are a few general steps that can be followed:

1. Extract individual frames from the video using a video processing library such as OpenCV.
2. Identify corresponding pixels in each frame using techniques, such as feature matching or optical flow.
3. Create a 3D point cloud by calculating the 3D coordinates of each pixel using the extracted frames or images.
4. Generating a 3D mesh using techniques like surface reconstruction or triangulation.
5. Preprocessing the 3D mesh by removing noise, smoothing it, or filling in any holes.
6. Export the 3D model to a 3D file format e.g. .obj, .ply.