User Interaction Phase

Users access the web application's homepage
They can upload video files in supported formats (MP4, AVI, MOV, MKV)
Maximum file size limit is set to 2GB
System validates the uploaded file type and presence

Initial File Handling

If validation fails, returns 400 error (no file or invalid type)
Valid files are securely saved in 'static/uploads/input_videos/' directory
System generates unique filenames using secure_filename()

Video Processing Pipeline

Uses MiDaS DPT_Large model for depth estimation
Processes video frame by frame with the following steps:

Converts frames from BGR to RGB
Applies MiDaS transforms
Generates depth predictions using the model
Normalizes depth maps
Creates colored visualizations

Output Generation

The system generates three types of outputs:

Depth Maps

Saved as PNG files in 'static/uploads/depth_maps/'
Normalized and converted to 8-bit images
Named sequentially (depth_00000.png, depth_00001.png, etc.)

Point Clouds

Generated using Open3D
Saved as PLY files in 'static/uploads/pointclouds/'
Created using depth information and original colors
Named sequentially (pointcloud_00000.ply, pointcloud_00001.ply, etc.)

Processed Video

Saved in 'static/uploads/output_videos/'
Blends original frames with colorized depth maps

Uses 60% original frame and 40% depth visualization
Maintains original video resolution and FPS

Final User Experience

Redirects to a 3D viewer after processing
Initially displays the first point cloud
Allows users to download processed files
Provides visual feedback of the depth estimation results

Technical Infrastructure

Built using Flask web framework
Uses OpenCV for video handling
Implements PyTorch for deep learning
Integrates Open3D for point cloud processing
Supports both CPU and GPU processing (automatically detected)

File Organization

The application maintains four main directories:

input_videos: For uploaded source videos
output_videos: For processed blended videos
depth_maps: For frame-by-frame depth images
pointclouds: For 3D point cloud data