**Design D0: High-Level System Overview**

In this high-level diagram (Design D0), we provide an overview of the system. The primary inputs to the system are 2D product images and configuration settings. The main output is high-quality 3D product models. The system consists of the following components:

* **Image Capture Rig**: This component captures multiple images from different angles.
* **Image Preprocessing**: It preprocesses the captured images to correct distortions.
* **Object Segmentation**: The Meta's SAM model segments the object from the background.
* **NeRF Algorithm**: This module performs 3D reconstruction of the segmented object.
* **Background Replacement**: An algorithm to replace backgrounds while preserving lighting.
* **3D Model Output**: The final 3D product models are generated as output.

**Design D1: Elaborated Module Interaction**

In Design D1, we elaborate on the interactions between the major modules identified in Design D0:

* The **Image Capture Rig** collects data from different viewpoints and lighting conditions.
* **Image Preprocessing** handles distortion correction and alignment of images.
* **Object Segmentation** uses Meta's SAM model to separate the object from the background.
* The **NeRF Algorithm** reconstructs 3D models from the segmented object.
* **Background Replacement** takes the 3D model and replaces the background.
* The final output consists of 3D models with replaced backgrounds.

**Design D2: Detailed Component Interactions**

In Design D2, we provide even more detailed insights into component interactions:

* The **Image Capture Rig** includes multiple cameras synchronized for simultaneous image capture.
* **Image Preprocessing** involves lens distortion correction, alignment, and noise reduction.
* **Object Segmentation** relies on Meta's SAM model to segment objects accurately.
* The **NeRF Algorithm** involves training and fine-tuning for optimal 3D reconstruction.
* **Background Replacement** ensures realistic lighting and shadows in the replaced backgrounds.
* The **User Interface (Optional)** allows users to interact with the system easily.