1. Understand the problem: Review the specifications document and ensure you have a clear understanding of the requirements, constraints, and objectives of the project. Identify the key challenges and scope of the system.
2. Data collection and preparation: Gather a dataset of images or videos containing SBM boxes, both conforming and non-conforming. These images will be used to train and validate the computer vision models. Preprocess the data, including resizing, cropping, and cleaning if necessary.
3. Design the computer vision pipeline: Determine the steps required to process the images and extract relevant information. This typically involves techniques such as image preprocessing, object detection, segmentation, feature extraction, and classification.
4. Choose appropriate computer vision algorithms and models: Based on the problem requirements and available resources, select the most suitable algorithms and models. For example, you might consider using deep learning models, such as convolutional neural networks (CNNs), for object detection and classification tasks.
5. Train the model: Split your dataset into training and validation sets. Use the training set to train the chosen model, adjusting the model's parameters and hyperparameters as needed. Validate the model's performance using the validation set and iterate on the training process if necessary.
6. Implement the hardware setup: Acquire the necessary hardware components mentioned in the specifications, including the camera, adjustable supports, display screen, and control unit. Set up the hardware components according to the proposed system design.
7. Develop the software components: Implement the software functionalities mentioned in the specifications, such as real-time data display, automated report generation, and historical data retrieval. Utilize appropriate programming languages and frameworks based on your skills and project requirements.
8. Integrate the hardware and software components: Connect the camera to the control unit, ensure data flow between the hardware and software components, and test their interaction.
9. Validate and optimize the solution: Evaluate the performance of the developed solution using sample SBM boxes. Make necessary adjustments to improve accuracy, speed, and reliability. Optimize the system for real-world conditions and handle any potential challenges or edge cases.
10. Document and report: Document the entire solution, including the implementation details, decisions made, and any challenges faced during the development process. Create user manuals or guides for operating the system, generating reports, and accessing historical data.