Robotics and Navigation in Medicine

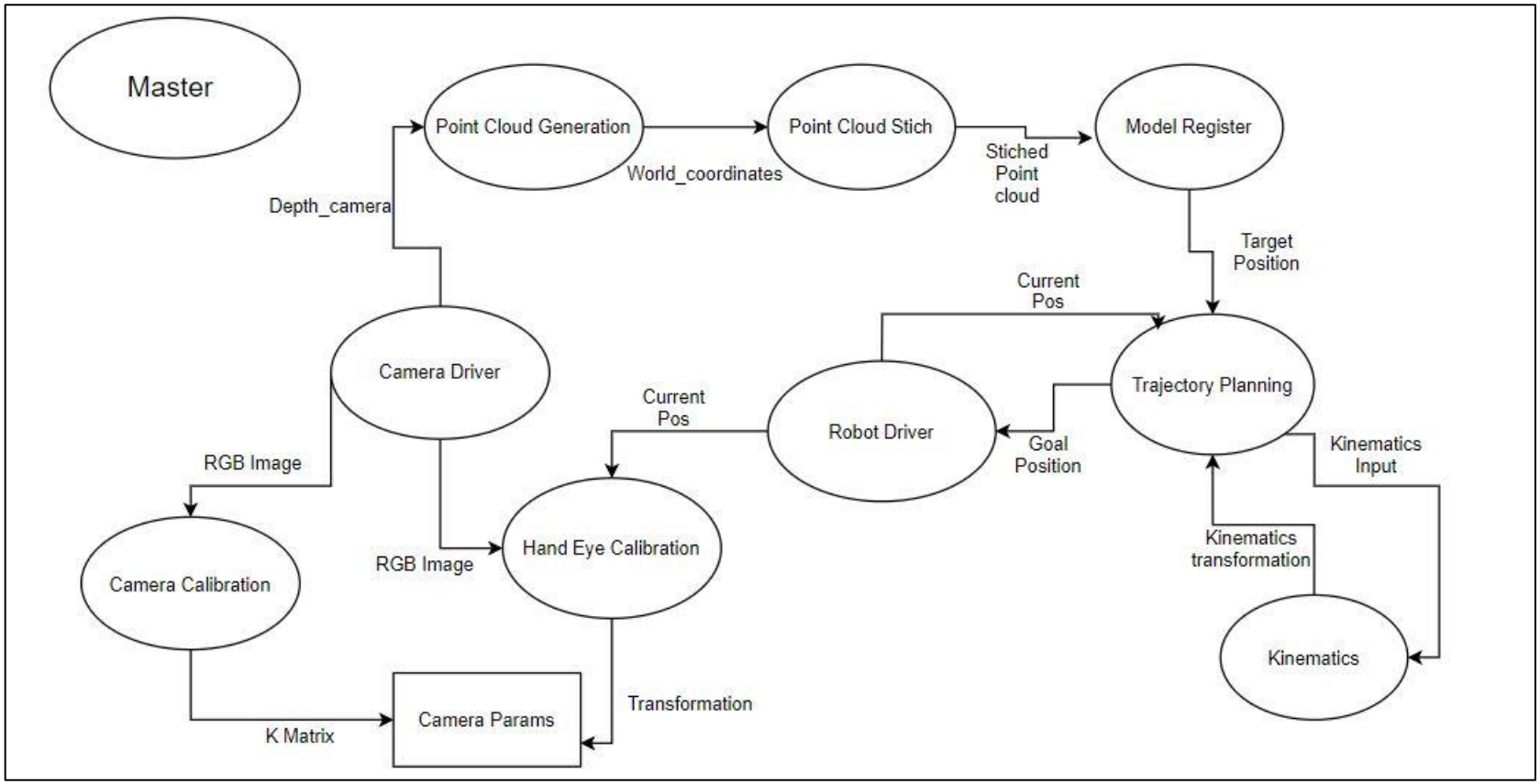
Group 2

Team Composition:

Project Plan:

Task ID	Task		Start date	Working D	End date	Deadline	KW 20	KW 21	KW22	KW 23	Kw24	KW 25	KW 26	KW 27	KW 28	07-Jul-20	08-Jul-20	09-Jul-20	10-Jul-20	11-Jul-20
Kinematics																				
1.1	Forward Kinematics	Planned	16-May-20	8	24-May-20	25-May-20														
		Actual		0																
1.2	Inverse Kinematics	Planned	27-May-20		28-Jun-20	29-Jun-20														
		Actual		0																
1.3	Trajectory Planning (Planning of feasible needle paths)	Planned	29-Jun-20		10-Jul-20	13-Jul-20														
		Actual		0																
Vision																				
2.1	Camera Calibration	Planned	18-May-20		01-Jun-20	06-Jul-20														
		Actual		0																
2.2	Hand-in-Eye Calibration	Planned	02-Jun-20		05-Jul-20	06-Jul-20														
		Actual		0																
2.3	Model recording and Registration	Planned	15-Jun-20		10-Jul-20	13-Jul-20														
		Actual		0																

Node Structure



Node Functionality:

- **Master:** will contain the main function to control the flow between different stages such as the initial calibration, object scanning , planning of trajectories and the final needle insertion.
- **Camera calibration:** Estimates intrinsic parameters of camera by taking input of calibration images.
- **Hand-eye calibration**: Estimates transformation from end-effector to camera projection center.
- **Point Cloud Generator:** Takes point cloud input from kinect camera and converts them to world coordinates.
- **Point Cloud Sticher**: Takes point clouds and matches points that are assumed to be identical. Output is a single pointcloud of entire scene.
- **Model Registration**: Registers point cloud with 3D Cad model and output needle target.
- **Trajectory Planning:** The trajectory planning for operations like camera calibration, point cloud generation and needle insertion will be done using this node. Based on the planned trajectory the output of the joint angles will be provided to the robot driver to execute the desired motion.
- **Kinematics:** Takes the joint space and Cartesian space position of the end-effector and returns joint parameters and vice versa i.e. performs the forward and inverse kinematics required for the trajectory planning.