Needs and Metrics Turn In

ADEV Image Correlation				
List of Needs and Metrics				
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	Stakeholders			
		ADEV	Wants a system that reliably locates strawberries	
		Strawberrry Farmer	Need a harvesting system that can finish the harvest within while strawberries are ripe	
			Prefer that strawberries are picked during nighttime to maximize time until spoil	
	Software Requi	CorrelationApp.py		
			1. Display video feeds of left and right webcams and depth camera	
			2. Set up click listener for both left and right webcam feed	
			2a. Use Correlator.py to find the distance to the clicked location	
			2b. Print the dx, dy, and dz displacement to the clicked location to the python console	
		Correlator.py		
			1. Import depth camera information and RGB video feeds	
			1a. If null is returned instead of video feeds, the image is obstructed and the robot must move its head.	
			1b. Displays video input to the monitor in named windows	
			2. Correlates the RGB webcams' pixels to each depth camera pixel	
			2a. Finds correlating pixel on left webcam feed (if not obstructed)	
			2b. Finds correlating pixel on right webcam feed (if not obstructed)	
			2c. Compares the two correlating pixels to check validity of correlation (if both not obstructed)	
			3. Method returns x, y, and z displacement from cameras to selected object in webcam's view	
			3a. Finds depth value of nearest correlated pixel	
			3b. Calculates dx, dy, and dz based on depth value and depth value pixel coordinate	
			3c. Prints displacement values to console (output method subject to change)	
			4. Allow for accuracy testing	
			4a. Self Accuracy. Compares the left and right correlated image against each other.	
			4b. Functional Accuracy. Given the actual distance to an object (strawberry), will report the difference between actual and measured distance	
			5. Display video feeds of left and right correlated images and final correlated image	
		camFeed.py		
			1. Reads webcam feed from a single camera	
			2. Calibrates video feed to remove radial barrel distortion	
			4. Outputs webcam data	
		PMDReciever.py		
			1. Receives depth camera feed from PmdUdpDumper.cpp in the form of two data packets	
			2. Correctly orders the two data packets into one image	
			3. Outputs depth array	
		PmdUdpDumper.cpp		
			1. Reads depth camera using PMD API	
			2. Splits data array into two arrays	
			3. Adds identifier to each array	
			4. Sends arrays as data packets on a local network port	
		calibration.py		
			1. Given .jpg files taken by a camera of a black and white checkerboard, outputs a matrix that can be used to remove a lens' distortion	
			1a. Load .jpg images	
			1b. Use built in function to generate a matrix based on the checkerboard in each image	
	Physical	Camera Mount	The mount will be made from material that excels at dissipating heat.	The heat sink will be made from aluminum, with a thermal conductivity of 205.0 W

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			The mount will be made from material that is easy to machine.	Aluminum is easy to machine and two members of our team have worked with it for Rose Ventures and Human Powred Vehicle Team
			The mount is made from an easily acquired material.	Aluminum 6061 stock is found on McMaster-Carr's website in a variety of forms.
			The mount will securely hold our time-of-flight sensor.	The sensor remains in the mount during operation of the robot. This can be tested by placing the sensor into the mount, then rotating it through angles past ones that the robot's arm will go through while picking strawberries. We expect this to be +/- 45 degree inclinations about any axis.
			The mount will hold the sensor in alignment	
			The mount must be light enough to be supported by the robot arm	Must weigh less than 0.5 lbs.