WPILib LabVIEW Math Library – VI Implementation List

Revision 3.05 3/01/2023 – Added execute routines for state space sim and ctrl

This documents which Java/C++ WPILIB routines have been duplicated in LabVIEW, and which ones are not needed (for example because all that is needed is a cluster unpack function), and what isn't done....yet...

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program
VI / CTL Totals	1264	1175	422	1189	716	49	12
VI Total (X)	1117	1056					
CTL Total (Z)	147	119					
VI Shell Total (/)	4						
CTRL Shell Total (\)	2						

Doc completed Pct
92.96%
Optimization Pct
56.65%

Optimize legend: S = Subroutine, I = Inline, X = reviewed, nothing done. (In some cases, after sufficient debug and use, additional optimizations could be considered.)

'============
BASE
'============

Category	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	All on for auto filter...
ANALOG DELAY	X	X	X	X	I			AnalogDelay_Execute.vi		Similar to interpolated tree map..				x
BUMPLESS TRANSFER	X	X	X	X	I			BumplessTransfer_Execute.vi						x
FUNCTION GENERATOR	X	X		X	I			FunctionGenerator_Add_Value.vi		Similar to interpolated tree map..				x
	X	X		X	I			FunctionGenerator_Add_XY.vi		Similar to interpolated tree map..				x
	X	X		X	I			FunctionGenerator_Calculate.vi		Similar to interpolated tree map..				x
	X	X		X	SI			FunctionGenerator_Clear.vi						x
	X	X	X	X	I			FunctionGenerator_Execute.vi		Similar to interpolated tree map..				x
	X	X		X	SI			FunctionGenerator_New.vi		Similar to interpolated tree map..				x
FUNCTION GENERATOR MATRIX	X	X	X	X	I			FunctionGeneratorMatrix_Add.vi		Similar to interpolated tree map..				x
	X	X	X	X	I			FunctionGeneratorMatrix_Calculate.vi		Similar to interpolated tree map..				x
	X	X	X	X	SI			FunctionGeneratorMatrix_New.vi		Similar to interpolated tree map..				x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
LEAD LAG	X	X	X	X	I			LeadLag_Execute.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
LINEAR FILTER	X	X		X	I			LinearFilter_BackwardFiniteDifference.vi					
	X	X		X	SI			LinearFilter_Calculate.vi					
	X	X	X	X	X			LinearFilter_CutoffFrequency.vi					
	X	X	X	X	I		X	LinearFilter_Execute.vi		Labview style helper			
	X	X		No	I			LinearFilter_Factorial.vi		AN INTERNAL ROUTINE			
	X	X		X	I			LinearFilter_FiniteDifference.vi					
	X	X		X	X			LinearFilter_HighPass.vi					
	X	X	X	X	X			LinearFilter_HighPassBW1.vi					
	X	X	X	X	X			LinearFilter_HighPassBW2.vi					
	X	X	X	X	X			LinearFilter_LowPassBW1.vi					
	X	X	X	X	X			LinearFilter_LowPassBW2.vi					
	X	X		X	X			LinearFilter_MovingAverage.vi					
	X	X		X	I			LinearFilter_New.vi					
	X	X		X	SI			LinearFilter_Reset.vi					
	X	X	X	X	SI			LinearFilter_ResetToValue.vi					
	X	X		X	X			LinearFilter_SinglePoleIIR.vi					
	X	X	X	X	X			LinearFilter_TimeConst.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
MEDIAN FILTER	X	X		X	X			MedianFilter_Calculate.vi					
	X	X	X	X	I		X	MedianFilter_Execute.vi		Labview style helper			
	X	X		X	SI			MedianFilter_New.vi					
	X	X		X	SI			MedianFilter_Reset.vi					
	X	X	X	X	SI			MedianFilter_ResetToValue.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
SLEW RATE FILTER	X	X		X	I			SlewRateLimiter_Calculate.vi					
	X	X	X	X	SI			SlewRateLimiter_Close.vi					
	X	X	X	X	I		X	SlewRateLimiter_Execute.vi		Labview style helper			
	X	X	X	X	SI			SlewRateLimiter_GetRate.vi					
	X	X		X	I			SlewRateLimiter_New.vi					
	X	X		X	I			SlewRateLimiter_NewInitialZero.vi					
	X	X		X	I			SlewRateLimiter_Reset.vi					
	X	X		X	SI			SlewRateLimiter_SetRate.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking

Revision 3.05 3/01/2023 – Added execute routines for state space sim and ctrl

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
TIMER	X	X	X	X				Timer_Close.vi		releases semaphore				x
	X	X		X			X	Timer_Get.vi						x
	X	X	X	X				Timer_GetAndReset.vi						x
	X	X	X	No				Timer_GetInternal.vi		Internal (private) only				x
	X	X		X			X	Timer_HasPeriodPassed.vi						x
	X	X	X	X			X	Timer_HasPeriodPassedOnce.vi						x
	X	X		X			X	Timer_New.vi						x
	X	X		X			X	Timer_Reset.vi						x
	X	X	X	No				Timer_ResetInternal		Internal (private) only				x
	X	X	X	X				Timer_Restart.vi						x
	X	X		X			X	Timer_Start.vi						x
	X	X	X	No				Timer_StartInternal.vi						x
	X	X		X			X	Timer_Stop.vi						x
	X	X	X	No				Timer_StopInternal.vi		Internal (private) only				x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
TIME INTERPOLATABLE BOOLEAN	X	X	X	X	I			TimeInterpBoolean_AddSample.vi		Update to use create matrix				x
	X	X	X	No	I			TimeInterpBoolean_CleanUp.vi		Update to use create matrix				x
	X	X	X	X	SI			TimeInterpBoolean_Clear.vi						x
	X	X	X	X	SI			TimeInterpBoolean_GetNewestSample.vi						x
	X	X	X	X	I			TimeInterpBoolean_GetSample.vi						x
								TimeInterpBoolean_GetTimeForValue.vi						x
	X	X	X	X	SI			TimeInterpBoolean_New.vi						x
	X	X	X	X	SI			TimeInterpBoolean_PopOldestSample.vi						x
	X	X	X	X	SI			TimeInterpBoolean_SetMaxTime.vi						x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
TIME INTERPOLATABLE DOUBLE	X	X	X	X	I			TimeInterpDouble_AddSample.vi		Update to use create matrix				x
	X	X	X	No	I			TimeInterpDouble_CleanUp.vi		Update to use create matrix				x
	X	X	X	X	SI			TimeInterpDouble_Clear.vi						x
	X	X	X	X	SI			TimeInterpDouble_GetNewestSample.vi						x
	X	X	X	X	I			TimeInterpDouble_GetSample.vi						x
	X	X	X	X				TimeInterpDouble_GetTimeForValue.vi						x
	X	X	X	X	SI			TimeInterpDouble_New.vi						x
	X	X	X	X	SI			TimeInterpDouble_PopOldestSample.vi						x
	X	X	X	X	SI			TimeInterpDouble_SetMaxTime.vi						x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
TIME INTERPOLATABLE POSE2D	X	X	X	X	I			TimeInterpPose2d_AddSample.vi		Update to use create matrix				x
	X	X	X	No	I			TimeInterpPose2d_CleanUp.vi		Update to use create matrix				x
	X	X	X	X	SI			TimeInterpPose2d_Clear.vi						x
	X	X	X	X	SI			TimeInterpPose2d_GetNewestSample.vi						x
	X	X	X	X	I			TimeInterpPose2d_GetSample.vi						x
								TimeInterpPose2d_GetTimeForValue.vi						x
	X	X	X	X	SI			TimeInterpPose2d_New.vi						x
	X	X	X	X	SI			TimeInterpPose2d_PopOldestSample.vi						x
	X	X	X	X	SI			TimeInterpPose2d_SetMaxTime.vi						x
														x

TIME INTERPOLATABLE ROTATION2D

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
X	X	X	X	I			TimeInterpRotation2d_AddSample.vi		Update to use create matrix			
X	X	X	No	I			TimeInterpRotation2d_CleanUp.vi		Update to use create matrix			
X	X	X	X	SI			TimeInterpRotation2d_Clear.vi					
X	X	X	X	SI			TimeInterpRotation2d_GetNewestSample.vi					
X	X	X	X	I			TimeInterpRotation2d_GetSample.vi					
							TimeInterpRotation2d_GetTimeForValue.vi					
X	X	X	X	SI			TimeInterpRotation2d_New.vi					
X	X	X	X	SI			TimeInterpRotation2d_PopOldestSample.vi					
X	X	X	X	SI			TimeInterpRotation2d_SetMaxTime.vi					

TIME INTERPOLATABLE VARIANT

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
X	X	X	X	I			TimeInterpVariant_AddSample.vi		Update to use create matrix			
X	X	X	No	I			TimeInterpVariant_CleanUp.vi		Update to use create matrix			
X	X	X	X	SI			TimeInterpVariant_Clear.vi					
X	X	X	X	SI			TimeInterpVariant_GetNewestSample.vi					
X	X	X	X	I			TimeInterpVariant_GetSample.vi					
							TimeInterpVariant_GetTimeForValue.vi					
X	X	X	X	I			TimeInterpVariant_Interpolate.vi		This is a template for a user created routine.			
X	X	X	X	SI			TimeInterpVariant_New.vi					
X	X	X	X	SI			TimeInterpVariant_PopOldestSample.vi					
X	X	X	X	SI			TimeInterpVariant_SetMaxTime.vi					

WAIT ADJUST

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
X	X	X	X				WaitAdjust.vi					

DIGITAL SEQUENTIAL LOGIC

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
X	X	X	X				DigSeqLogic_Delay.vi					
X	X	X	X				DigSeqLogic_On_Delay.vi					
X	X	X	X				DigSeqLogic_Off_Delay.vi					
X	X	X	X				DigSeqLogic_One_Shot.vi					
X	X	X	X				DigSeqLogic_SR_Flip_Flop.vi					

DEBOUNCER

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
X	X		X				Debouncer_New.vi					
X	X		X				Debouncer_Calculate.vi					
X	X	X	X				Debouncer_Execute.vi					
X	X		No				Debouncer_Reset.vi					
X	X		No				Debouncer_HasElapsed.vi					

													x

'============
CONTROLLER
'============

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
ARM FF	X	X		X				ArmFF_Calculate.vi						x
	X	X		X				ArmFF_CalculateVelocityOnly.vi						x
			X					ArmFF_Execute.vi		LabVIEW style single call				x
			X					ArmFF_ExecuteVelocityOnly.vi		LabVIEW style single call				x
	X	X		X				ArmFF_MaxAchieveAccel.vi						x
	X	X		X				ArmFF_MaxAchieveVelocity.vi						x
	X	X		X				ArmFF_MinAchieveAccel.vi						x
	X	X		X				ArmFF_MinAchieveVelocity.vi						x
	X	X		X				ArmFF_New_ZeroGravity.vi						x
	X	X		X				ArmFF_New.vi						x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
BANG BANG	X	X		X	SI			BangBang_AtSetpoint.vi						x
	X	X		X	SI			BangBang_Calculate_PV.vi						x
	X	X		X	SI			BangBang_Calculate_SP_PV.vi						x
	X	X	X	X	SI			BangBang_Execute.vi						x
	X	X		X	SI			BangBang_GetAll.vi						x
	X	X		X	SI			BangBang_GetError.vi						x
	X	X		X	SI			BangBang_New.vi						x
	X	X		X	SI			BangBang_SetSetpoint.vi						x
	X	X		X	SI			BangBang_SetTolerance.vi						x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
CONTROLLER UTIL	X	X		X	SI			ControllerUtil_GetModulusError.vi		This was short lived in WPILIB, but still useful here.				x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
ELEV FF	X	X		X				ElevFF_Calculate.vi						x
	X	X		X				ElevFF_CalculateVelocityOnly.vi						x
			X					ElevFF_Execute.vi		LabVIEW style single call				x
			X					ElevFF_ExecuteVelocityOnly.vi		LabVIEW style single call				x
	X	X		X				ElevFF_MaxAchieveAccel.vi						x
	X	X		X				ElevFF_MaxAchieveVelocity.vi						x
	X	X		X				ElevFF_MinAchieveAccel.vi						x
	X	X		X				ElevFF_MinAchieveVelocity.vi						x
	X	X		X				ElevFF_New_ZeroAccel.vi						x
	X	X		X				ElevFF_New.vi						x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
HOL_DRV_CTRL	X	X	X	X				HolDrvCtrl_AdvCalculate_Trajectory.vi		Added 1/24/2022				x
	X	X	X	X				HolDrvCtrl_AdvCalculate.vi		Added 1/24/2022				x
	X	X		X	SI			HolDrvCtrl_AtReference.vi		Added 1/26/21				x
	X	X		X	I			HolDrvCtrl_Calculate_Trajectory.vi		Added 1/26/21				x
	X	X		X	I			HolDrvCtrl_Calculate.vi		Added 1/26/21				x
	X	X	X	X				HolDrvCtrl_Execute_Trajectory.vi		Added 1/24/2022				x
	X	X	X	X				HolDrvCtrl_Execute.vi		Future				x
	X	X		X	SI			HolDrvCtrl_New.vi		Added 1/26/21				x
	X	X	X	X	SI			HolDrvCtrl_PackExecuteSP.vi						x
	X	X	X	X				HolDrvCtrl_PackPID.vi		Added 1/24/2022				x
	X	X	X	X				HolDrvCtrl_PackProfPID.vi		Added 1/24/2022				x
	X	X		X	SI			HolDrvCtrl_SetEnabled.vi		Added 1/26/21				x
	X	X		X	SI			HolDrvCtrl_SetTolerance.vi		Added 1/26/21				x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
PID AUTOTUNE	X	X	X	No				PIDAutoTune_ClosedLoopStep.vi						x
	X	X	X	No				PIDAutoTune_Convert_Academic_To_NonInteracting.vi						x
	x	X	X	No				PIDAutoTune_OpenLoopStep.vi						x
	X	X	X	X				PIDAutoTune_SetTuningArguments.vi						x
	X	X	X	X				PIDAutoTune_Step_Execute.vi						x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
PID CONTROLLER	X	X	X	X				PIDController_AdvCalculate_FF_Sp_Pv_Per.vi		Advanced PID				x
	X	X	X	X				PIDController_AdvCalculate_FF_Sp_Pv.vi		Advanced PID				x
	X	X	X	X			X	PIDController_AdvExecute.vi		Labview style helper. Advanced PID				x
	X	X		X	SI			PIDController_AtSetpoint.vi						x
	X	X		X				PIDController_Calculate_PV.vi						x
	X	X		X				PIDController_Calculate_SP_PV.vi						x
	X	X		X	SI			PIDController_DisableContinousInput.vi						x
	X	X		X	SI			PIDController_EnableContinousInput.vi						x
	X	X	X	X			X	PIDController_Execute.vi		Labview style helper				x
								PIDController_GetContinuousError.vi		OBSOLETE – Removed				x
	X	X		X	SI			PIDController_GetPeriod.vi						x
	X	X		X	SI			PIDController_GetPID.vi						x
	X	X		X	SI			PIDController_GetPositionError.vi						x
	X	X		X	SI			PIDController_GetSetpoint.vi						x
	X	X		X	SI			PIDController_GetTolerance.vi						x
	X	X		X	SI			PIDController_GetVelocityError.vi						x
	X	X		X	SI			PIDController_IsContinuousInputEnabled.vi						x
	X	X		X	I			PIDController_New.vi						x
	X	X		X	I			PIDController_NewPeriod.vi						x
	X	X	X	X	SI			PIDController_Pack_AdvLimits.vi						x
	X	X	X	X	SI			PIDController_Pack_AdvTuning.vi						x
	X	X	X	X	SI			PIDController_Pack_ErrorTolerance.vi						x
	X	X	X	X	SI			PIDController_Pack_InputLimits.vi						x
	X	X	X	X	SI			PIDController_Pack_Tuning.vi						x
	X	X		X	SI			PIDController_Reset.vi						x
	X	X		X	SI			PIDController_SetD.vi						x
	X	X	X	X	SI			PIDController_SetDerivativeFilter.vi		Advanced PID				x
	X	X	X	No				PIDController_SetFeedForward_OBSOLETE_DELETE.vi		Advanced PID, Obsolete – DELETE				x

X	X	X	No				PIDController_SetFFGain_OBSOLETE_DELETE.vi		Advanced PID, Obsolete – DELETE				x
X	X		X	SI			PIDController_SetI.vi						x
							PIDController_SetInputRange.vi		OBSOLETE – Removed				x
X	X		X	SI			PIDController_SetIntegratorRange.vi						x
X	X	X	X	SI			PIDController_SetOutputLimits.vi		Advanced PID				x
X	X		X	SI			PIDController_SetP.vi						x
X	X	X	X	SI			PIDController_SetPeriod.vi						x
X	X		X	SI			PIDController_SetPID.vi						x
X	X	X	X	SI			PIDController_SetPIDF.vi		Advanced PID				x
X	X		X	SI			PIDController_SetSetpoint.vi						x
X	X		X	SI			PIDController_SetTolerance.vi						x
X	X		X	SI			PIDController_SetTolerancePandV.vi						x
													x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
PROFILED PID CONTROLLER	X	X		X	SI			ProfiledPIDController_AtGoal.vi						x
	X	X		X	SI			ProfiledPIDController_AtSetpoint.vi						x
	X	X		X				ProfiledPIDController_Calculate_Meas_Goal.vi						x
	X	X		X				ProfiledPIDController_Calculate_Meas_StateGoal_TrapCnsrt.vi						x
	X	X		X				ProfiledPIDController_Calculate_Meas_StateGoal.vi						x
	X	X		X				ProfiledPIDController_Calculate_Meas.vi						x
	X	X		X	SI			ProfiledPIDController_DisableContInput.vi						x
	X	X		X	SI			ProfiledPIDController_EnableContInput.vi						x
	X	X	X	X	I			ProfiledPIDController_Execute.vi		Single call LabVIEW style function.				x
	X	X		X	SI			ProfiledPIDController_GetGoal.vi						x
	X	X		X	SI			ProfiledPIDController_GetPeriod.vi						x
	X	X	X	X	SI			ProfiledPIDController_GetPID.vi		WPILIB has separate getters.				x
	X	X		X	SI			ProfiledPIDController_GetPositionError.vi						x
	X	X		X	SI			ProfiledPIDController_GetSetpoint.vi						x
	X	X		X	SI			ProfiledPIDController_GetTolerance.vi						x
	X	X		X	SI			ProfiledPIDController_GetVelocityError.vi						x
	X	X		X	I			ProfiledPIDController_New.vi						x
	X	X		X	I			ProfiledPIDController_NewPeriod.vi						x
	X	X		X	SI			ProfiledPIDController_Reset_PosOnly.vi						x
	X	X		X	SI			ProfiledPIDController_Reset_PosVel.vi						x
	X	X		X	SI			ProfiledPIDController_Reset.vi						x
	X	X		X	SI			ProfiledPIDController_SetConstraints.vi						x
	X	X		X	SI			ProfiledPIDController_SetGoal_PosOnly.vi						x
	X	X		X	SI			ProfiledPIDController_SetGoal.vi						x
	X	X		X	SI			ProfiledPIDController_SetIntegratorRange.vi						x
	X	X		X	SI			ProfiledPIDController_SetPID.vi						x
	X	X		X	SI			ProfiledPIDController_SetTolerance_PosOnly.vi						x
	X	X		X	SI			ProfiledPIDController_SetTolerance_PosVel.vi						x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
RAMSETE	X	X		X	SI			Ramsete_AtReference.vi	AtReference					x
	X	X		X	X			Ramsete_Calculate_Trajectory.vi	calculate_trajectory					x
	X	X		X	X			Ramsete_Calculate.vi	calculate					x
	X	X	X	X	X			Ramsete_Diff_DO_Eng.vi						x
	X	X	X	X	X			Ramsete_Diff_DO_SI.vi						x
	X	X	X	X	I			Ramsete_Execute_ENG.vi	Use this one!!					x
	X	X	X	X	SI			Ramsete_Execute_PackTuning_ENG.vi						x
	X	X	X	X	SI			Ramsete_Execute_PackTuning.vi						x
	X	X	X	X	I			Ramsete_Execute.vi						x
	X	X		X	SI			Ramsete_New_B_Z.vi	new(b, zeta)					x
	X	X		X	SI			Ramsete_New.vi	new					x
	X	X		X	SI			Ramsete_SetEnabled.vi	SetEnabled					x
	X	X		X	SI			Ramsete_SetTolerance.vi	SetTolerance					x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
	X	X		X	X			Ramsete_SINC.vi	sinc	internal				x
														x
														x
SIMPLE MOTOR FEEDFORWARD	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
	X	X	X	X	SI			SimpleMotorFF_Calculate_CalcAccel.vi						x
	X	X		X				SimpleMotorFF_Calculate_NextV_Dt.vi						x
	X	X		X	SI			SimpleMotorFF_Calculate.vi	public double calculate(double velocity, double acceleration)					x
	X	X		X	SI			SimpleMotorFF_CalculateVelocityOnly.vi	public double calculate(double velocity)					x
	X	X	X	X				SimpleMotorFF_Ka_AutoTune.vi						x
	X	X		X	X			SimpleMotorFF_MaxAchieveAccel.vi	public double maxAchievableAcceleration(double maxVoltage, double velocity)					x
	X	X		X	X			SimpleMotorFF_MaxAchieveVel.vi	public double maxAchievableVelocity(double maxVoltage, double acceleration)					x
	X	X		X	X			SimpleMotorFF_MinAchieveAccel.vi	public double minAchievableAcceleration(double maxVoltage, double velocity)					x
	X	X		X	X			SimpleMotorFF_MinAchieveVel.vi	public double minAchievableVelocity(double maxVoltage, double acceleration)					x
	X	X		X	SI			SimpleMotorFF_New.vi	public SimpleMotorFeedforward(double ks, double kv, double ka)					x
	X	X	X	X	SI			SimpleMotorFF_Pack_Ka_Tune_Params.vi						x
									public SimpleMotorFeedforward(double ks, double kv)					x
														x
'==========														x
GEOMETRY														x
'==========														x
														x
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
COORDINATE AXIS	X	X		X	SI			CoordAxis_D.vi						x
	X	X		X	SI			CoordAxis_E.vi						x
	X	X		X	SI			CoordAxis_N.vi						x
	X	X		X	SI			CoordAxis_New.vi						x
	X	X		X	SI			CoordAxis_S.vi						x
	X	X		X	SI			CoordAxis_U.vi						x
	X	X		X	SI			CoordAxis_W.vi						x
														x
														x
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
COORDINATE SYSTEM	X	X		X	SI	X		CoordSystem_Convert_Pose3d.vi						x
	X	X		X	SI			CoordSystem_Convert_Rotation3d.vi						x
	X	X		X	SI			CoordSystem_Convert_Translation3d.vi						x
	X	X		X	SI			CoordSystem_Convert_Transform3d.vi						x
	X	X		X	SI	X		CoordSystem_EDN.vi						x
	X	X		X	SI	X		CoordSystem_NED.vi						x
	X	X		X	SI	X		CoordSystem_New.vi						x
	X	X		X	SI	X		CoordSystem_NWU.vi						x
														x
														x
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
POSE2D	X	X		X	SI			Pose2d_Div.VI						x
	X	X		X	SI			Pose2d_Equals.VI	boolean equals(other obj)					x
	X	X		X	X			Pose2d_Exp.vi	pose2d exp(twist2d twist)					x
	X	X		X	SI			Pose2d_getRotation.vi	rotation2d getRotation()	can also use cluster unpack				x

	X	X		X	SI			Pose2d_getTranslation.vi	translation2d getTranslation()	can also use cluster unpack				x
	X	X	X	X	SI			Pose2d_getXY.vi						x
	X	X	X	X	SI			Pose2d_getXYAngle.vi						x
	X	X		X	I			Pose2d_Interpolate.vi						x
	X	X		X	X			Pose2d_Log.vi	twist2d log(pose2d end)					x
	X	X		X	SI			Pose2d_Minus.vi	transform2d minus(pose2d other)					x
	X	X		X	SI			Pose2d_New_TRRO.vi	pose2d new(translation2d, rotation2d)					x
	X	X		X	SI			Pose2d_New.vi	pose2d new(double x, double y, rotation2d)					x
	X	X		X	SI			Pose2d_Plus.vi	pose2d plus(transform2d other)					x
	X	X		X	SI			Pose2d_RelativeTo.vi	pose2d relativeto(pose2d other)					x
	X	X		X	SI			Pose2d_Times.vi						x
	X	X		X	SI			Pose2d_TransformBy.vi	pose2d transformby(transform2d other)					x
									pose2d new( )	can use cluster constant				x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
POSE3D	X	X		X	SI			Pose3d_Div.vi						x
	X	X		X	SI			Pose3d_Equals.VI						x
	X	X		X	X			Pose3d_Exp.vi						x
	X	X		X	SI			Pose3d_getRotation.vi						x
	X	X		X	SI			Pose3d_getTranslation.vi						x
	X	X	X	X	SI			Pose3d_getXYZ.vi						x
	X	X		X	I			Pose3d_Interpolate.vi						x
	X	X		X	X			Pose3d_Log.vi						x
	X	X		X	SI			Pose3d_Minus.vi						x
	X	X		X	SI			Pose3d_New.vi						x
	X	X		X	SI			Pose3d_New_Default.vi						x
	X	X		X	SI			Pose3d_New_Pose2d.vi						x
	X	X		X	SI			Pose3d_New_Trans3dRot3d.vi						x
	X	X		X	SI			Pose3d_Plus.vi						x
	X	X		X	SI			Pose3d_RelativeTo.vi						x
	X	X		No	SI			Pose3d_RotationVectorToMatrix.vi						x
	X	X		X	SI			Pose3d_ToPose2d.vi						x
	X	X		X	SI			Pose3d_Times.vi						x
	X	X		X	SI			Pose3d_TransformBy.vi						x
														x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
QUATERNION	X	X		X	SI			*Quaternion_Equals.vi*						x
	X	X		X	SI			Quaternion_Get_All.vi						x
	X	X		X	SI			Quaternion_Get_LVQuat.vi						x
	X	X		X	SI			Quaternion_Get_Vect.vi						x
	X	X		X	SI			Quaternion_Get_W.vi						x
	X	X		X	SI			Quaternion_Inverse.vi						x
	X	X		X	SI			Quaternion_New.vi						x
	X	X		X	SI			Quaternion_New_Default.vi						x
	X	X		X	SI			Quaternion_New_LVQuat.vi						x
	X	X		X	SI			Quaternion_Normalize.vi						x
	X	X		X	SI			Quaternion_Plus.vi						x
	X	X		X	SI			Quaternion_Times.vi						x
	X	X		X	SI			Quaternion_ToRotationVector.vi						x
														x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking

ROTATION2D

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
X	X		X	SI			Rotation2d_CreateAngle.vi	rotation2d new(double value)					x
X	X		X	SI			Rotation2d_CreateAngleDegrees.vi	rotation2d fromDegrees(double degrees)	convert to radians then create				x
X	X		X	SI			Rotation2d_CreateAngleRotations.vi						x
X	X		X	SI			Rotation2d_CreateXY.vi	rotation2d new(double x, double y)					x
X	X		X	SI			Rotation2d_Div.vi						x
X	X		X	SI			Rotation2d_Equals.vi	boolean equals(rotation2d other)					x
X	X	X	X	SI			Rotation2d_GetAngleCosSin.vi		New 1/26/21				x
X	X		X	SI			Rotation2d_GetCos.VI	double getCos()	use cluster unpack				x
X	X		X	SI			Rotation2d_GetDegrees.VI	double getDegrees()	use cluster unpack, then convert to degree				x
X	X		X	SI			Rotation2d_GetRadians.VI	double getRadians()	use cluster unpack				x
X	X		X	SI			Rotation2d_GetRotations.vi						x
X	X		X	SI			Rotation2d_GetSin.VI	double getSin()	use cluster unpack				x
X	X		X	SI			Rotation2d_GetTan.VI	double getTan()	can calculate				x
X	X		X	SI			Rotation2d_Interpolate.vi						x
X	X		X	SI			Rotation2d_Minus.vi	rotation2d minus(rotation2d other)					x
X	X		X	SI			Rotation2d_Plus.vi	rotation2d plus(rotation2d other)					x
X	X		X	SI			Rotation2d_RotateBy.vi	rotation2d rotateby(rotation2d other)					x
X	X		X	SI			Rotation2d_Times.vi	rotation2d times(double scalar)					x
X	X		X	SI			Rotation2d_UnaryMinus.vi	rotation2d unaryminus( )					x
								rotation2d new()	can use cluster constant				x

ROTATION3D

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
X	X		X	SI			Rotation3d_Create_AxisAngle.vi						x
X	X		X	SI			Rotation3d_Create_Default.vi						x
X	X		X	SI			Rotation3d_Create_Quaternion.vi						x
X	X		X	I			Rotation3d_Create_InitialFinalVector.vi						x
X	X		X	SI			Rotation3d_Create_RollPitchYaw.vi						x
X	X		X	I			Rotation3d_Create_RotMatrix.vi						x
X	X		X	SI			Rotation3d_Div.vi						x
X	X		X	SI			Rotation3d_Equals.vi						x
X	X	X	X	SI			Rotation3d_GetAxisAngle.vi						x
X	X		X	SI			Rotation3d_GetQuaternion.vi						x
X	X		X	SI			Rotation3d_GetXYZ.vi						x
X	X		X	SI			Rotation3d_Interpolate.vi						x
X	X		X	SI			Rotation3d_Minus.vi						x
X	X		X	SI			Rotation3d_Plus.vi						x
X	X		X	SI			Rotation3d_RotateBy.vi						x
X	X		X	SI			Rotation3d_Times.vi						x
X	X		X	SI			Rotation3d_ToRotation2d.vi						x
X	X		X	SI			Rotation3d_UnaryMinus.vi						x
													x

TRANSFORM2D

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
X	X		X	SI			Transform2d_Create_PosePose.vi	transform2d new(pose2d, pose2d)					x
X	X		X	SI			Transform2d_Create_TransRot.vi	transform2d new(translation2d, rotation2d)					x
X	X		X	SI			Transform2d_Div.vi						x
X	X		X	SI			Transform2d_Equals.VI	boolean equals(other transform2d)					x
X	X		X	SI			Transform2d_GetRotation.VI	rotation2d getRotation()	use cluster unpack				x
X	X		X	SI			Transform2d_GetTranslation.VI	translation2d getTranslation()	use cluster unpack				x
X	X	X	X	SI			Transform2d_GetXY.vi						x
X	X	X	X	SI			Transform2d_GetXYAngle.vi						x
X	X		X	SI			Transform2d_Inverse.vi	transform inverse()	new				x
X	X		X	Si			Transform2d_Plus.vi						x
X	X		X	SI			Transform2d_Times.vi	transform2d times(double scalar)					x
								transform2d new( )	can use cluster constant				x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
TRANSFORM3D	X	X		X	SI			Transform3d_Create_Default.vi						x
	X	X		X	SI			Transform3d_Create_Pose3dPose.3dvi						x
	X	X		X	SI			Transform3d_Create_Trans3dRot3d.vi						x
	X	X		X	SI			Transform3d_Div.vi						x
	X	X		X	SI			Transform3d_Equals.VI						x
	X	X		X	SI			Transform3d_GetRotation3d.VI						x
	X	X		X	SI			Transform3d_GetTranslation3d.VI						x
	X	X	X	X	SI			Transform3d_GetXYZ.vi						x
	X	X		X	SI			Transform3d_Inverse.vi						x
	X	X		X	Si			Transform3d_Plus.vi						x
	X	X		X	SI			Transform3d_Times.vi						x
														x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
TRANSLATION2D	X	X		X	SI			Translation2d_Create_DistAng.vi						x
	X	X		X	SI			Translation2d_Create.vi	translation2d new(double x, double y)					x
	X	X		X	SI			Translation2d_Div.vi						x
	X	X		X	SI			Translation2d_Equals.vi	boolean equals(translation other)					x
	X	X		X	SI			Translation2d_GetAngle.vi						x
	X	X		X	SI			Translation2d_GetDistance.vi	double getDistance(translation2d other)					x
	X	X		X	SI			Translation2d_GetNorm.VI	double getNorm()	can use cluster unpack				x
	X	X		X	SI			Translation2d_GetX.VI	double getX()	can use cluster unpack				x
	X	X	X	X	SI			Translation2d_GetXY.VI						x
	X	X		X	SI			Translation2d_GetY.VI	double getY()	can use cluster unpack				x
	X	X		X	SI			Translation2d_Interpolate.vi						x
	X	X		X	SI			Translation2d_Minus.vi	translation2d minus(translation2d other)					x
	X	X		X	SI			Translation2d_Plus.vi	translation2d plus(translation2d other)					x
	X	X		X	SI			Translation2d_RotateBy.vi	translation2d rotateBy(rotation2d other)					x
	X	X		X	SI			Translation2d_Times.vi	translation2d times(double scalar)					x
	X	X		X	SI			Translation2d_UnaryMinus.vi	translation2d unaryminus( )					x
									translation2d new()	can use cluster constant				x
									translation2d div(double scalar)	can multiply by 1/scalar				x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
TRANSLATION3D	X	X		X	SI			Translation3d_Create.vi						x
	X	X		X	SI			Translation3d_Create_Default.vi						x
	X	X		X	SI			Translation3d_Create_DistAng.vi						x
	X	X		X	SI			Translation3d_Div.vi						x
	X	X		X	SI			Translation3d_Equals.vi						x
	X	X		X	SI			Translation3d_GetDistance.vi						x
	X	X		X	SI			Translation3d_GetNorm.VI						x
	X	X	X	X	SI			Translation3d_GetXYZ.vi						x
	X	X		X	SI			Translation3d_Interpolate.vi						x
	X	X		X	SI			Translation3d_Minus.vi						x
	X	X		X	SI			Translation3d_Plus.vi						x
	X	X		X	SI			Translation3d_RotateBy.vi						x
	X	X		X	SI			Translation3d_Times.vi						x
	X	X		X	SI			Translation3d_ToTranslation2d.vi						x
	X	X		X	SI			Translation3d_UnaryMinus.vi						x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
TWIST2D	X	X		X	SI			Twist2d_Create.vi	twist new(x, y, theta)				
	X	X		X	SI			Twist2d_Equals.VI	boolean equals(obj other)				
	X	X	X	X	SI			Twist2d_GetAll.VI					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
TWIST3D	X	X		X	SI	X		Twist3d_Create.vi					
	X	X		X	SI	X		Twist3d_Equals.VI					
	X	X	X	X	SI	X		Twist3d_GetAll.VI					

'============
KINEMATICS
'============

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
CHASSIS SPEEDS	X	X		X	SI			ChassisSpeeds_FromFieldRelativeChassisSpeeds.VI					
	X	X		X	SI			ChassisSpeeds_FromFieldRelativeSpeeds.VI	chassisspeeds fromFieldRelativeSpeeds(double x, double y, double angvel, rotation2d robotangle)				
	X	X	X	X	SI			ChassisSPeeds_GetXYOmega.vi					
	X	X		X	SI			ChassisSpeeds_New.vi	chassisspeeds new (double xvel, double yvel, double angvel)				
									chassisspeeds new ()	can use cluster constant			

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE KINEMATICS	X	X		X	I	X		DiffKinematics_New.vi	diffDriveKine new(double trackWidth)				
	X	X		X	X	X		DiffKinematics_toChassisSpeed.vi	chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds)				
	X	X		X	SI			DiffKinematics_ToTwist2d.vi					
	X	X		X	SI	X		DiffKinematics_toWheelSpeed.vi	diffDriveWheelSpeed toWheelSpeeds(chassisSpeeds)				

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE ODOMETRY			X					DiffOdometry_Execute.vi		DONT NEED			
	X	X		X	X			DiffOdometry_Update.vi	pose2d update(rotation2d gyro, double leftdist, double right dist)	Incorporates enhanced reset			
									diffDrOdom new(rotation gyro, pose initial)				
									diffDrOdom new(rotation gyro)				
									void resetPosition(pose2d, rotation2d)	incorporated into “update”			
									pose2d getPoseMeters()				

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
DIFFERENTIAL DRIVE ODOMETRY 2	X	X	X	X	I			DiffDrvOdom2_Execute.vi		Replacement for orig diff drive odom				x
	X	X		X	SI			DiffDrvOdom2_GetPose.vi						x
	X	X		X	I			DiffDrvOdom2_New.vi						x
	X	X		X	SI			DiffDrvOdom2_Reset.vi						x
	X	X		X	I			DiffDrvOdom2_Update.vi						x
														x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
DIFFERENTIAL DRIVE WHEEL SPEEDS									diffDrWheelSpeeds new()					x
									diffDrWheelSpeeds new(double leftVel, double rightVel)					x
	X	X		X	X			DiffWheel_Normalize.vi	void normalize(double maxVel)					x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
MECANUM DRIVE KINEMATICS	X	X		X	I			MecaKinematics_New.vi						x
	X	X		X	X			MecaKinematics_SetInverseKinematics.vi						x
	X	X		X	X			MecaKinematics_ToChassisSpeeds.vi						x
	X	X		X				MecaKinematics_ToTwist2d.vi						x
	X	X		X	X			MecaKinematics_ToWheelSpeeds.vi						x
	X	X		X	X			MecaKinematics_ToWheelSpeedsZeroCenter.vi						x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
MECANUM DRIVE MOTOR VOLTAGE														x
nothing done														x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
MECANUM DRIVE ODOMETRY			X					MecaOdometry_Execute.vi						x
	X	X	X	X	X			MecaOdometry_GetKinematics.vi						x
	X	X		X				MecaOdometry_GetPose.vi						x
	X	X		X				MecaOdometry_New.vi						x
	X	X		X				MecaOdometry_NewDefaultPose.vi						x
	X	X		X				MecaOdometry_Reset.VI						x
	X	X		X				MecaOdometry_Update.vi						x
								MecaOdometry_UpdateWithTime.vi		Removed…				x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
MECANUM DRIVE WHEEL POSITION	X	X		X	SI			MecaWheelPos_Get.vi						x
	X	X		X	SI			MecaWheelPos_New.vi						x
	X	X		X	SI			MecaWheelPos_Sub.vi						x
														x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
MECANUM DRIVE WHEEL SPEEDS	X	X		X	SI			MecaWheel_New.Vi	public MecanumDriveWheelSpeeds(double frontLeftMetersPerSecond, double frontRightMetersPerSecond, double rearLeftMetersPerSecond, double rearRightMetersPerSecond)					x
	X	X	X	X	SI			MecaWheel_GetAll.vi						x
	X	X		X	X			MecaWheel_Normalize.vi	public void normalize(double attainableMaxSpeedMetersPerSecond)					x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
SWERVE DRIVE KINEMATICS	X	X	X	X				SwerveKinematics_New4.VI		For 4 module drives				x
	X	X	X	X				SwerveKinematics_NewX.VI		uses array as input				x
	X	X	X	X				SwerveKinematics_NormalizeWheelSpeeds.vi	public static void normalizeWheelSpeeds(SwerveModuleState[] moduleStates, double attainableMaxSpeedMetersPerSecond)					x
	X	X	X	X				SwerveKinematics_ToChassisSpeeds4.VI		For 4 module drives				x
	X	X	X	X				SwerveKinematics_ToChassisSpeedsX.VI		uses array as input				x
	X	X		X				SwerveKinematics_ToSwerveModuleStates.VI	public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds, Translation2d centerOfRotationMeters)					x
	X	X		X				SwerveKinematics_ToSwerveModuleStatesZeroCenter.VI	public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds)					x
	X	X		X				SwerveKinematics_ToTwist2d4.VI						x
	X	X		X				SwerveKinematics_ToTwist2dX.VI						x
									public SwerveDriveKinematics(Translation2d... wheelsMeters)	variable parameters (replace with array and “4” calls)				x
									public ChassisSpeeds toChassisSpeeds(SwerveModuleState... wheelStates)	variable parameters (replace with array and “4” calls)				x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
SWERVE DRIVE ODOMETRY								SwerveOdometry_Execute4.vi						x
								SwerveOdometry_ExecuteX.vi						x
	X	X		X				SwerveOdometry_GetPosition.VI	public Pose2d getPoseMeters()					x
	X	X		X				SwerveOdometry_New.VI	public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose)					x
	X	X		X				SwerveOdometry_NewZeroCenter.VI	public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle)					x
	X	X		X				SwerveOdometry_ResetPosition.VI	public void resetPosition(Pose2d pose, Rotation2d gyroAngle)					x
	X	X	X	X				SwerveOdometry_Update4.VI		For 4 module drives				x
								SwerveOdometry_UpdateWithTime4.VI		REMOVED				x
								SwerveOdometry_UpdateWithTimeX.VI		REMOVED				x
	X	X	X	X				SwerveOdometry_UpdateX.VI		uses array as input				x
									public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState... moduleStates)	variable parameters (replace with array and “4” calls)				x

									public Pose2d update(Rotation2d gyroAngle, SwerveModuleState... moduleStates)	variable parameters (replace with array and “4” calls)				x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
SWERVE DRIVE MODULE POSITIONS	X	X		X	SI			SwerveModulePosition_CompareTo.vi						x
	X	X		X	SI			SwerveModulePosition_Equals.vi						x
	X	X		X	SI			SwerveModulePosition_Get.vi						x
	X	X		X	SI			SwerveModulePosition_New.vi						x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
SWERVE DRIVE MODULE STATE	X	X		X	SI			SwerveModuleState_CompareTo.vi	public int compareTo(SwerveModuleState o)					x
	X	X		X	SI			SwerveModuleState_Equal.vi						x
	X	X		X	SI			SwerveModuleState_Get.vi						x
	X	X		X	SI			SwerveModuleState_New.vi	public SwerveModuleState(double speedMetersPerSecond, Rotation2d angle)					x
	X	X		X	SI			SwerveModuleState_Optimize.vi	public SwerveModuleState optimize(SwerveModuleState desired, Rotation2d angle)					x

'============
SPLINE
'============

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
CUBIC HERMITE SPLINE								`	protected SimpleMatrix getCoefficients()	not needed, use cluster unpack				x
	X	X		X				CubicHermiteSpline_getControlVectorFromArrays.vi	private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector)					x
	X	X		X				CubicHermiteSpline_makeHermiteBasis.vi	private SimpleMatrix makeHermiteBasis()					x
	X	X		X				CubicHermiteSpline_New.vi	public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector)					x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
POSE WITH CURVATURE	X	X		X	SI			PoseWithCurve_New.vi	public PoseWithCurvature(Pose2d poseMeters, double curvatureRadPerMeter)					x
									public PoseWithCurvature()	can use cluster constant				x
									public Pose2d poseMeters	not needed, use cluster unpack				x
									public double curvatureRadPerMeter..	not needed, use cluster unpack				x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
QUINTIC HERMITE SPLINE	X	X		X				QuinticHermiteSpline_getControlVectorFromArrays.vi	private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector)					x
	X	X		X				QuinticHermiteSpline_makeHermiteBasis.vi	private SimpleMatrix makeHermiteBasis()					x

	X	X		X				QuinticHermiteSpline_New.vi	public QuinticHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector)					x
									protected SimpleMatrix getCoefficients()	not needed, use cluster unpack				x
														x
														x
	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes	*Code Review*	*Test Program*	*Error Checking*	
SPLINE (Abstract class)	X	X		X				Spline_getPoint.vi	public PoseWithCurvature getPoint(double t)					x
									Spline(int degree)					x
									public static class ControlVector					x
									public ControlVector(double[] x, double[] y)	implemented as data structure				x
														x
														x
	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes	*Code Review*	*Test Program*	*Error Checking*	
SPLINE HELPER	X	X		X	SI			SplineHelp_GetCubicCtrlVector.vi	private static Spline.ControlVector getCubicControlVector(double scalar, Pose2d point)					x
	X	X		X		X		SplineHelp_GetCubicCtrlVectorsFromWayPts.vi	public static Spline.ControlVector[] getCubicControlVectorsFromWaypoints(Pose2d start, Translation2d[] interiorWaypoints, Pose2d end)					x
	X	X	X	X				SplineHelp_GetCubicCtrlVectorsFromWeightedWayPts.vi						x
	X	X	X	*No*				SplineHelp_GetCubicSpline_Calc1.vi		internal				x
	X	X	X	*No*				SplineHelp_GetCubicSpline_Calc2.vi		internal				x
	X	X	X	*No*				SplineHelp_GetCubicSpline_Calc3.vi		internal				x
	X	X		X		X		SplineHelp_getCubicSplinesFromControlVectors.vi	public static CubicHermiteSpline[] getCubicSplinesFromControlVectors(Spline.ControlVector start, Translation2d[] waypoints, Spline.ControlVector end)					x
	X	X		X	SI			SplineHelp_GetQuinticCtrlVector.vi	private static Spline.ControlVector getQuinticControlVector(double scalar, Pose2d point)					x
								SplineHelp_GetQuinticCtrlVectorsFromWayPts.vi	public static List<Spline.ControlVector> getQuinticControlVectorsFromWaypoints(List<Pose2d> waypoints)	REMOVED 2762				x
								SplineHelp_GetQuinticCtrlVectorsFromWeightedWayPts.vi		REMOVED 2762				x
	X	X		X				SplineHelp_getQuinticSplinesFromControlVectors.vi	public static QuinticHermiteSpline[] getQuinticSplinesFromControlVectors(Spline.ControlVector[] controlVectors)					x
	X	X	X	X				SplineHelp_GetQuinticSplinesFromWeightedWayPts.vi		New 2762				x
	X	X		X				SplineHelp_GetQuinticSplinesFromWayPts.vi		New 2762				x
	X	X		*No*				SplineHelp_ThomasAlgorithm.vi	private static void thomasAlgorithm(double[] a, double[] b, double[] c, double[] d, double[] solutionVector)	internal				x
														x
														x
	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes	*Code Review*	*Test Program*	*Error Checking*	
SPLINE PARAMETERIZER	X	X		X				SplineParam_Spline_T0_T1.vi	public static List<PoseWithCurvature> parameterize(Spline spline, double t0, double t1)					x
	X	X		X		X		SplineParam_Spline.vi	public static List<PoseWithCurvature> parameterize(Spline spline)					x
	X	X	X	*No*				SplineParam_StackGet.vi		internal				x
	X	X	X	*No*				SplineParam_StackPop.vi		internal				x
	X	X	X	*No*				SplineParam_StackPush.vi		internal				x
														x
	'==========													x
	TRAJECTORY													x
	'==========													x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
TRAJECTORY	X	X		X				Trajectory_Concatenate.vi						x
	X	X		X				Trajectory_equals.vi	boolean equals(other obj)	FUTURE				x
	X	X		X	SI			Trajectory_GetStates.vi	public List<State> getStates()	not needed, use unpack				x
	X	X		X	SI			Trajectory_GetTotalTime.vi	public double getTotalTimeSeconds()	not needed, use unpack				x
	X	X		No	SI			Trajectory_lerp_double.vi	private static double lerp(double startValue, double endValue, double t)	internal				x
	X	X		No	SI			Trajectory_lerp_Pose.vi	private static Pose2d lerp(Pose2d startValue, Pose2d endValue, double t)	internal				x
	X	X		X	SI			Trajectory_New_Empty.vi						x
	X	X		X	SI			Trajectory_New.vi	public Trajectory(final List<State> states)					x
	X	X		X				Trajectory_RelativeTo.vi	public Trajectory relativeTo(Pose2d pose)					x
	X	X		X				Trajectory_Sample.vi	public State sample(double timeSeconds)					x
	X	X	X	X				Trajectory_SampleReverse.vi		Sample in reverse order. Negate sample.				x
	X	X		X				Trajectory_TransformBy.vi	public Trajectory transformBy(Transform2d transform)					x
									public Pose2d getInitialPose()	can use cluster unpack, array index				x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
TRAJECTORY_STATE	X	X		X	SI			TrajectoryState_Equals.vi	boolean equals(other obj)					x
	X	X	X	X	SI			TrajectoryState_GetAll.vi						x
	X	X		X	SI			TrajectoryState_GetPose.vi						x
	X	X		X				TrajectoryState_Interpolate.vi	State interpolate(State endValue, double i)					x
	X	X		X	SI			TrajectoryState_New.vi	public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter)					x
									public State()					x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
TRAJECTORY CONFIG	X	X		X				TrajectoryConfig_AddConstraint.vi	public TrajectoryConfig addConstraint(TrajectoryConstraint constraint)	Implemented differently, can't duplicate.				x
	X	X		X				TrajectoryConfig_AddConstraints.vi	public TrajectoryConfig addConstraints(List<? extends TrajectoryConstraint> constraints)	Implemented differently, can't duplicate.				x
	X	X		X	SI			TrajectoryConfig_Create.vi	public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq)					x
	X	X		X				TrajectoryConfig_GetCentripetalAccel.vi						x
	X	X	X	X				TrajectoryConfig_GetConstraints.vi	public List<TrajectoryConstraint> getConstraints()	Implemented differently, can't duplicate.				x
	X	X		X				TrajectoryConfig_GetEndVelocity.vi	public double getEndVelocity()	can use cluster unpack				x
	X	X		X				TrajectoryConfig_GetKinematicsDiffDrive.vi						x
	X	X		X				TrajectoryConfig_GetKinematicsMecanumfDrive.vi						x
	X	X		X				TrajectoryConfig_GetKinematicsSwerveDrive.vi						x
	X	X	X	X				TrajectoryConfig_GetMaxVelAccel.vi						x
	X	X		X				TrajectoryConfig_GetStartVelocity.vi	public double getStartVelocity()	can use cluster unpack				x
	X	X		X				TrajectoryConfig_GetVoltageDiffDrive.vi						x
	X	X		X				TrajectoryConfig_IsReversed.vi	public boolean isReversed()	can use cluster unpack				x
	X	X	X	X	SI			TrajectoryConfig_setCentripetalAccel.vi						x
	X	X		X				TrajectoryConfig_SetEndVelocity.vi	public TrajectoryConfig setEndVelocity(double endVelocityMetersPerSecond)					x
	X	X		X	SI			TrajectoryConfig_setKinematicsDiffDrive.vi	public TrajectoryConfig setKinematics(DifferentialDriveKinematics kinematics)					x
	X	X		X	SI			TrajectoryConfig_setKinematicsMecanumfDrive.vi	public TrajectoryConfig setKinematics(MecanumDriveKinematics kinematics)					x

X	X		X	SI			TrajectoryConfig_setKinematicsSwerveDrive.vi	public TrajectoryConfig setKinematics(SwerveDriveKinematics kinematics)					x
X	X		X	SI			TrajectoryConfig_setReversed.vi	public TrajectoryConfig setReversed(boolean reversed)					x
X	X		X				TrajectoryConfig_SetStartVelocity.vi	public TrajectoryConfig setStartVelocity(double startVelocityMetersPerSecond)					x
X	X	X	X	SI			TrajectoryConfig_setVoltageDiffDrive.vi						x
								public double getMaxVelocity()	Created function to return both				x
								public double getMaxAcceleration()	Created function to return both				x
								NOTE ADD OTHER "SET" ROUTINES FOR OTHER CONTRAINTS HERE, SINCE NEW CONTRAINTS ARE SPECIFIC AND NOT GENERIC.					x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
TRAJECTORY GENERATE	X	X		X				TrajectoryGenerate_Make_Cubic_CtrlVect.vi	public static Trajectory generateTrajectory(Spline.ControlVector initial, List<Translation2d> interiorWaypoints, Spline.ControlVector end, TrajectoryConfig config)	uses cubic splines				x
	X	X		X				TrajectoryGenerate_Make_Cubic.vi	public static Trajectory generateTrajectory(Pose2d start, List<Translation2d> interiorWaypoints, Pose2d end, TrajectoryConfig config)	uses cubic splines				x
	X	X	X	X				TrajectoryGenerate_Make_Generic.vi	Helper to bring these all together….	Use this one!!!				x
	X	X		X				TrajectoryGenerate_Make_Quintic_CtrlVect.vi	public static Trajectory generateTrajectory(ControlVectorList controlVectors, TrajectoryConfig config)	uses quintic splines				x
	X	X	X	X				TrajectoryGenerate_Make_Quintic_Weighted.vi		New 2762				x
	X	X		X				TrajectoryGenerate_Make_Quintic.vi	public static Trajectory generateTrajectory(List<Pose2d> waypoints, TrajectoryConfig config)	uses quintic splines				x
	X	X		X				TrajectoryGenerate_splinePointsFromSplines.vi	public static List<PoseWithCurvature> splinePointsFromSplines(Spline[] splines)					x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
TRAJECTORY GENERATE (Control Vector)									public ControlVectorList(int initialCapacity)	may not need, just data				x
									public ControlVectorList()	may not need, just data				x
									public ControlVectorList(Collection<? extends Spline.ControlVector> collection)	may not need, just data				x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
TRAJECTORY PARAMETERIZE	X	X	X	No				TrajectoryParam_calcStuffFwd.vi						x
	X	X	X	No				TrajectoryParam_calcStuffRev.vi						x
	X	X		No				TrajectoryParam_enforceAccel.vi	private static void enforceAccelerationLimits(boolean reverse, List<TrajectoryConstraint> constraints, ConstrainedState state)	This routines needs to be changed when new constraints are added.				x
	X	X	X	No				TrajectoryParam_enforceVelocity.vi		This routines needs to be changed when new constraints are added.				x
	X	X		X				TrajectoryParam_timeParam.vi	public static Trajectory timeParameterizeTrajectory(List<PoseWithCurvature> points. List<TrajectoryConstraint> constraints, double startVelocityMetersPerSecond, double endVelocityMetersPerSecond, double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq, boolean reversed)					x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
TRAJECTORY PARAMETERIZE CONSTRAINED STATE	X	X		X				ConstrainedState_New.vi	ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double maxAccelerationMetersPerSecondSq)					x
	X	X	X	X				ConstrainedState_SetMaxAccel.vi						x
	X	X	X	X				ConstrainedState_SetMinAccel.vi						x
	X	X	X	X				ConstrainedState_SetVelAccel.vi						x
	X	X	X	X				ConstrainedState_SetVelocity.vi						x
									ConstrainedState()					x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
TRAJECTORY UTIL	X	X		X				TrajectoryUtil_fromPathWeaverJSON.vi	public static Trajectory fromPathweaverJson(Path path)					x
	X	X	X	X	X			TrajectoryUtil_MakeWeightedWayPoint_ENG.vi						x
	X	X	X	X	X			TrajectoryUtil_MakeWeightedWayPoint.vi						x
	X	X		X				TrajectoryUtil_toPathWeaverJSON.vi	public static void toPathweaverJson(Trajectory trajectory, Path path)					x
									public static Trajectory deserializeTrajectory(String json)					x
									public static String serializeTrajectory(Trajectory trajectory)					x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	
TRAPEZOID PROFILE	X	X		X				TrapProfConstraint_New.vi			x
	X	X		X				TrapProfile_Calculate.vi			x
	X	X		*No*				TrapProfile_Direct.vi		Private, remove from menu	x
	X	X	X	X				TrapProfile_Execute.vi			x
	X	X	X	X	*SI*			TrapProfile_Execute_AtGoal.vi			x
	X	X		X				TrapProfile_IsFinished.vi			x
	X	X		X				TrapProfile_New_DefInitial.vi			x
	X	X		X				TrapProfile_New.vi			x
	X	X		*No*				TrapProfile_ShouldFlipAcceleration.vi		Private, remove from menu	x
	X	X		X				TrapProfile_TimeLeftUntil.vi			x
	X	X		X				TrapProfile_TotalTime.vi			x
	X	X		X				TrapProfState_Equals.vi			x
	X	X		X				TrapProfState_New.vi			x
											x

'============
TRAJECTORY CONSTRAINT
'============

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	
CENTRIPETAL ACCELERATION CONSTRAINT	X	X		X				CentripetalAccelConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)		x
	X	X		X				CentripetalAccelConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)		x
	X	X		X	*SI*			CentripetalAccelConstraint_New.vi	public CentripetalAccelerationConstraint(double maxCentripetalAccelerationMetersPerSecondSq)	Can use cluster pack for now	x

DIFF DRIVE KINEMATIC CONSTRAINT

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
X	X		X				DiffDriveKinematicsConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
X	X		X				DiffDriveKinematicsConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
X	X		X	SI			DiffDriveKinematicsConstraint_New.vi	public DifferentialDriveKinematicsConstraint(final DifferentialDriveKinematics kinematics, double maxSpeedMetersPerSecond)	

DIFF DRIVE VOLTAGE CONSTRAINT

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
X	X		X				DiffDriveVoltageConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
X	X		X				DiffDriveVoltageConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
X	X		X	SI			DiffDriveVoltageConstraint_New.vi	public DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	

ELLIPTICAL REGION CONSTRAINT

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
X	X		X				EllipRegionConstraint_getMaxVelocity.vi		
X	X		X				EllipRegionConstraint_getMinMaxAccel.vi		
X	X		X				EllipRegionConstraint_IsPoseInRegion.vi		
X	X		X				EllipRegionConstraint_New.vi		

JERK CONSTRAINT

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
/		X					JerkConstraint_getMaxVelocity.vi	Routine exists, it is just a shell	FUTURE
/		X					JerkConstraint_getMinMaxAccel.vi	Routine exists, it is just a shell	FUTURE
/		X		SI			JerkConstraint_New.vi	Routine exists, it is just a shell	FUTURE

MAX VELOCITY CONSTRAINT

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
X	X		X	SI			MaxVelocityConstraint_getMaxVelocity.vi		
X	X		X	SI			MaxVelocityConstraint_getMinMaxAccel.vi		
X	X		X	SI			MaxVelocityConstraint_New.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
MECANUM DRIVE KINEMATICS CONSTRAINT	X	X		X				MecaDriveKinematicsConstraint_getMaxVelocity.vi		
	X	X		X				MecaDriveKinematicsConstraint_getMinMaxAccel.vi		
	X	X		X	SI			MecaDriveKinematicsConstraint_New.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
RECTANGULAR REGION CONSTRAINT	X	X		X				RectRegionConstraint_getRectRegion.vi		
	X	X		X				RectRegionConstraint_getMinMaxAccel.vi		
	X	X		X				RectRegionConstraint_IsPoseInRegion.vi		
	X	X		X				RectRegionConstraint_New.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
SWERVE DRIVE KINEMATICS CONSTRAINT	X	X		X				SwerveDriveKinematicsConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X				SwerveDriveKinematicsConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X	SI			SwerveDriveKinematicsConstraint_New.vi	Newpublic SwerveDriveKinematicsConstraint(final SwerveDriveKinematics kinematics, double maxSpeedMetersPerSecond)	Can use cluster pack for now

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TRAJECTORY CONSTRAINT	X	X	X	X				TrajConstraint_GetMaxVelocity.vi		
	X	X	X	X				TrajConstraint_GetMinMaxAccel.vi		
	X	X	X	X				TrajConstraint_GetType.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TRAJECTORY CONSTRAINT (Min Max)	X	X		X	SI			Constraint_MinMax_New.vi	Constraint_MinMax_New	
	X	X		X	SI			Constraint_MinMax_NewMinMax.VI	Constraint_MinMax_New	

'============
UTILITY
'============
THESE ROUTINES ARE SPECIFIC TO LABVIEW. THEY DO NOT HAVE A
JAVA / C++ WPILIB EQUIVALENT

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
UTIL	X	X	X	X	SI			Util_ApproxEqual.vi		
	X	X	X	X				Util_Array_PoseWCurv_to_XY.vi		
	X	X	X	X	SI			Util_CalcDist.vi		
	X	X	X	X	SI			Util_GetLibraryVersion.vi		
	X	X	X	X	SI			Util_GetLibUsage.vi		
	X	X	X	X				Util_GetTime.vi		Once tested completely, this should be optimized!
	X	X	X	No	I			Util_GetTime_U32.vi		
	X	X	X	No	I			Util_GetTime_U64.vi		
	X	X	X	No	N/A			Util_LibraryGlobals.vi		Global Variables – no block diag.
	X	X	X	X				Util_Trajectory_Absolute_To_Relative.vi		
	X	X	X	X				Util_Trajectory_ReadFile.vi		
	X	X	X	X				Util_Trajectory_to_XY.vi		
	X	X	X	No				Util_Trajectory_WriteFile_Config.vi		internal
	X	X	X	No				Util_Trajectory_WriteFile_OneState.vi		internal
	X	X	X	X				Util_Trajectory_WriteFile_PathFinder.vi		
	X	X	X	No				Util_Trajectory_WriteFile_PathFinderConfig.vi		internal
	X	X	X	X				Util_Trajectory_WriteFile_Pathweaver.vi		
	X	X	X	No				Util_Trajectory_WriteFile_States.vi		internal
	X	X	X	No				Util_Trajectory_WriteFile_WayPoints.vi		internal
	X	X	X	X				Util_Trajectory_WriteFile.vi		
	X	X	X	X				Util_TrajectoryState_Meters_To_Inches.vi		
	X	X	X	X				Util_TrajState_to_DiffDrive_WheelPos.vi		
	X	X	X	X				Util_DispWaypoint_Eng_To_SI.vi		
	X	X	X	X				Util_DispWaypoint_To_CubicInput.vi		
	X	X	X	X				Util_DispWaypoint_To_QuinticInput.vi		
	X	X	X	X				Util_DispWeightedWaypiont_Eng_To_WeightedWaypoint		
	X	X	X	No				Util_DispWeightedWayPoint_To_WeightedWayPoint.vi		Sorry about the confusing name..

'============
CONVERSIONS
'============
THESE ROUTINES ARE SPECIFIC TO LABVIEW. THEY DO NOT HAVE A
JAVA / C++ WPILIB EQUIVALENT

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
CONV	X	X	X	X	SI			Conv_AngleDegrees_Heading.vi		
	X	X	X	X	SI			Conv_AngleRadians_Heading.vi		
	X	X	X	X	SI			Conv_Centimeters_Meters.vi		
	X	X	X	X	SI			Conv_Deg_Radians.vi		
	X	X	X	X	SI			Conv_Deg_Rotations.vi		
	X	X	X	X	SI			Conv_Feet_Meters.vi		
	X	X	X	X	SI			Conv_GyroDegrees_Heading.vi		
	X	X	X	X	SI			Conv_Heading_AngleRadians.vi		
	X	X	X	X	SI			Conv_Inches_Meters.vi		
	X	X	X	X	SI			Conv_Kilograms_Pounds.vi		
	X	X	X	X	SI			Conv_Meters_Feet.vi		
	X	X	X	X	SI			Conv_Meters_Inches.vi		
	X	X	X	X	SI			Conv_Pose2d_SI_Eng.vi		
	X	X	X	X	SI			Conv_Pounds_Kilograms.vi		
	X	X	X	X	SI			Conv_Radians_Deg.vi		
	X	X	X	X	SI			Conv_Radians_Rotations.vi		
	X	X	X	X	SI			Conv_Rotations_Deg.vi		
	X	X	X	X	SI			Conv_Rotations_Radians.vi		
	X	X	X	X	SI			Conv_Yards_Meters.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
UNITS	X	X		X	SI			Units_DegreesToRadians.vi		
	X	X		X	SI			Units_DegreesToRotations.vi		
	X	X		X	SI			Units_FeetToMeters.vi		
	X	X		X	SI			Units_InchesToMeters.vi		
	X	X		X	SI			Units_MetersToFeet.vi		
	X	X		X	SI			Units_MetersToInches.vi		
	X	X		X	SI			Units_MillisecondsToSeconds.vi		
	X	X		X	SI			Units_RadiansPerSecondToRotationsPerMinute.vi		
	X	X		X	SI			Units_RadiansToDegrees.vi		
	X	X		X	SI			Units_RadiansToRotations.vi		
	X	X		X	SI			Units_RotationsPerMinuteToRadiansPerSecond.vi		
	X	X		X	SI			Units_RotationsToDegrees.vi		
	X	X		X	SI			Units_RotationsToRadians.vi		
	X	X		X	SI			Units_SecondsToMilliseconds.vi		

'============
PATHFINDER UTIL
'============
THESE ROUTINES ARE SPECIFIC TO LABVIEW. THEY DO NOT HAVE A
JAVA / C++ WPILIB EQUIVALENT

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
PATHFINDERUTIL	X	X	X	X				PathfinderUtil_Continuous_Heading_Difference.vi		
	X	X	X	X				PathfinderUtil_OptimizeTrajectoryStates.vi		
	X	X	X	X				PathfinderUtil_ToTrajectory.vi		
	X	X	X	X				PathfinderUtil_ToTrajectoryStates.vi		

'============
STATE SPACE MODEL
'============

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DC MOTOR	X	X		X	SI			DCMotor_GetAndymark9015.vi					
	X	X		X	SI			DCMotor_GetAndymarkAM2235A.vi					
	X	X		X	SI			DCMotor_GetAndymarkAM3493.vi					
	X	X		X	SI			DCMotor_GetAndymarkRs775_125.vi					
	X	X		X	SI			DCMotor_GetBag.vi					
	X	X		X	SI			DCMotor_GetBanebotsRs550.vi					
	X	X		X	SI			DCMotor_GetBanebotsRs775.vi					
	X	X		X	SI			DCMotor_GetCIM.vi					
	X	X		X	SI			DCMotor_GetCurrent.vi					
	X	X		X	SI			DCMotor_GetFalcon500.vi					
	X	X		X	SI			DCMotor_GetMiniCIM.vi					
	X	X		X	SI			DCMotor_GetNEO.vi					
	X	X		X	SI			DCMotor_GetNEO550.vi					
	X	X		X	SI			DCMotor_GetRomiBuiltIn.vi					
	X	X		X	SI			DCMotor_GetSpeed.vi					
	X	X		X	SI			DCMotor_GetTorque.vi					
	X	X		X	SI			DCMotor_GetVex775Pro.vi					
	X	X		X	SI			DCMotor_New.vi					
	X	X		X	SI			DCMotor_PickMotor.vi					
	X	X		X	SI			DCMotor_WithReduction.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
														x
														x
														x
LINEAR SYSTEM ID	X	X		X				LinearSystemId_CreateDCMotorSystem.vi						x
	X	X		X				LinearSystemId_CreateDriveTrainVelocitySystem.vi		Update to use create matrix				x
	X	X		X				LinearSystemId_CreateElevatorSystem.vi		Update to use create matrix				x
	X	X		X				LinearSystemId_CreateFlywheelSystem.vi		Update to use create matrix				x
	X	X		X				LinearSystemId_CreateSingleJointedArmSystem.vi		Update to use create matrix				x
	X		X	X				LinearSystemId_DCMotor_Pack_Model_Params.vi						x
	X		X	X				LinearSystemId_DiffDrv_ID_Pack_Model_Params.vi						x
	X		X	X				LinearSystemId_DiffDrv_Pack_Model_Params.vi						x
	X		X	X				LinearSystemId_Elevator_Pack_Model_Params.vi						x
	X		X	X				LinearSystemId_FlyWheel_Pack_Model_Params.vi						x
	X	X		X				LinearSystemId_IdentifyDriveTrainSystem.vi		Update to use create matrix				x
	X	X		X				LinearSystemId_IdentifyPositionSystem.vi		Update to use create matrix				x
	X	X		X				LinearSystemId_IdentifyVelocitySystem.vi		Update to use create matrix				x
	X		X	X				LinearSystemId_SngJntArm_Pack_Model_Params.vi						x
														x
														x
														x
'============														x
STATE SPACE ESTIMATION														x
'============														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
DIFFERENTIAL DRIVE POSE ESTIMATOR	X	X		X				DiffDrivePoseEst_AddVisionMeasurement.vi						x
	X	X		X				DiffDrivePoseEst_FillStateVector.vi						x
	X	X		X				DiffDrivePoseEst_GetEstimatedPosition.vi						x
	X	X		X				DiffDrivePoseEst_Kalman_F_Callback.vi						x
	X	X		X				DiffDrivePoseEst_Kalman_H_Callback.vi						x
	X	X		X				DiffDrivePoseEst_New.vi						x
	X	X		X				DiffDrivePoseEst_ResetPosition.vi						x
	X	X		X				DiffDrivePoseEst_SetVisionMeasurementStdDevs.vi						x
	X	X		X				DiffDrivePoseEst_Update.vi						x
	X	X		X				DiffDrivePoseEst_UpdateWithTime.vi						x
	X	X		X				DiffDrivePoseEst_VisionCorrect_Callback.vi						x
	X	X		X				DiffDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi						x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
DIFFERENTIAL DRIVE POSE ESTIMATOR 2	X	X		X				DiffDrivePoseEst2_AddVisionMeasurement.vi						x
	X		X	NO	SI			DiffDrivePoseEst2_BufferDuration.vi						x
	X	X		X				DiffDrivePoseEst2_GetEstimatedPosition.vi						x
	X	X	X	No				DiffDrivePoseEst2_InterpRecord_ExtractFromVar.vi						x
	X	X		No				DiffDrivePoseEst2_InterpRecord_Interp.vi						x
	X	X		No				DiffDrivePoseEst2_InterpRecord_New.vi						x
	X	X		X				DiffDrivePoseEst2_New.vi						x
	X	X		X				DiffDrivePoseEst2_ResetPosition.vi						x
	X	X		X				DiffDrivePoseEst2_SetVisionMeasurementStdDevs.vi						x
	X	X		X				DiffDrivePoseEst2_Update.vi						x
	X	X		X				DiffDrivePoseEst2_UpdateWithTime.vi						x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
EXTENDED KALMAN FILTER	X	X		X				ExtendedKalmanFilter_Correct_OnlyUY.vi					
	X	X		X				ExtendedKalmanFilter_Correct.vi		Just a shell, not functional!			
	X	X		X				ExtendedKalmanFilter_GetP_Single.vi					
	X	X		X				ExtendedKalmanFilter_GetP.vi					
	X	X		X				ExtendedKalmanFilter_GetXHat_Single.vi					
	X	X		X				ExtendedKalmanFilter_GetXHat.vi					
	X	X		X				ExtendedKalmanFilter_New.vi					
	X	X		X				ExtendedKalmanFilter_Predict.vi					
	X	X		X				ExtendedKalmanFilter_Reset.vi					
	X	X		X				ExtendedKalmanFilter_SetP.vi					
	X	X		X				ExtendedKalmanFilter_SetXHat_Single.vi					
	X	X		X				ExtendedKalmanFilter_SetXHat.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILTER	X	X		X		X		KalmanFilter_Correct.vi					
	X	X		X				KalmanFilter_GetK					
	X	X		X				KalmanFilter_GetK_Single.vi					
	X	X		X				KalmanFilter_GetXHat					
	X	X		X		X		KalmanFilter_GetXHaT_Single					
	X	X		X		X		KalmanFilter_New.vi					
	X	X		X		X		KalmanFilter_Predict.vi					
	X	X		X				KalmanFilter_Reset.vi					
	X	X		X				KalmanFilter_SetXHat					
	X	X		X		X		KalmanFilter_SetXHat_Single					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILTER LATENCY COMPENSATOR	X	X		X				KalmanFilterLatencyComp_AddObserverState.vi					
	X	X		X				KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi					
	X	X		X				KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.vi					
	X	X		X				KalmanFilterLatencyComp_FindClosestMeasurement.vi					
	X	X		X				KalmanFilterLatencyComp_New.vi					
	X	X		X				KalmanFIlterLatencyComp_Observer_New.vi					
	X	X		X				KalmanFilterLatencyComp_Reset.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
MECANUM DRIVE POSE ESTIMATOR								MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi					
	X	X		X				MecaDrivePoseEst_AddVisionMeasurement.vi					
	X	X		X				MecaDrivePoseEst_GetEstimatedPosition.vi					
	X	X		*No*				MecaDrivePoseEst_Kalman_F_Callback.vi					
	X	X		*No*				MecaDrivePoseEst_Kalman_H_Callback.vi					
	X	X		X				MecaDrivePoseEst_New.vi					
	X	X		X				MecaDrivePoseEst_ResetPosition.vi					
	X	X		X				MecaDrivePoseEst_SetVisionMeasurementStdDevs.vi					

X	X		X				MecaDrivePoseEst_Update.vi						x
X	X		X				MecaDrivePoseEst_UpdateWithTime.vi						x
X	X		No				MecaDrivePoseEst_VisionCorrect_Callback.vi						x
X	X		No				MecaDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi						x
													x
													x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
MECANUM DRIVE POSE ESTIMATOR 2	X			X				MecaDrivePoseEst2_AddVisionMeasurement.vi						x
	X		X	NO	SI			MecaDrivePoseEst2_BufferDuration.vi						x
	X			X				MecaDrivePoseEst2_GetEstimatedPosition.vi						x
	X		X	No				MecaDrivePoseEst2_InterpRecord_ExtractFromVar.vi						x
	X			No				MecaDrivePoseEst2_InterpRecord_Interp.vi						x
	X			No				MecaDrivePoseEst2_InterpRecord_New.vi						x
	X			X				MecaDrivePoseEst2_New.vi						x
	X			X				MecaDrivePoseEst2_ResetPosition.vi						x
	X			X				MecaDrivePoseEst2_SetVisionMeasurementStdDevs.vi						x
	X			X				MecaDrivePoseEst2_Update.vi						x
	X			X				MecaDrivePoseEst2_UpdateWithTime.vi						x
														x
														x
														x
														x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
SWERVE DRIVE POSE ESTIMATOR								SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi						x
	X	X		X				SwerveDrivePoseEst_AddVisionMeasurement.vi						x
	X	X		X				SwerveDrivePoseEst_GetEstimatedPosition.vi						x
	X	X		X				SwerveDrivePoseEst_Kalman_F_Callback.vi						x
	X	X		X				SwerveDrivePoseEst_Kalman_H_Callback.vi						x
	X	X		X				SwerveDrivePoseEst_New.vi						x
	X	X		X				SwerveDrivePoseEst_ResetPosition.vi						x
	X	X		X				SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi						x
	X	X		X				SwerveDrivePoseEst_Update.vi						x
	X	X		X				SwerveDrivePoseEst_UpdateWithTime.vi						x
	X	X		X				SwerveDrivePoseEst_VisionCorrect_Callback.vi						x
	X	X		X				SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi						x
														x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
SWERVE DRIVE POSE ESTIMATOR 2	X			X				SwerveDrivePoseEst2_AddVisionMeasurement.vi						x
	X		X	NO	SI			SwerveDrivePoseEst2_BufferDuration.vi						x
	X			X				SwerveDrivePoseEst2_GetEstimatedPosition.vi						x
	X		X	No				SwerveDrivePoseEst2_InterpRecord_ExtractFromVar.vi						x
	X			No				SwerveDrivePoseEst2_InterpRecord_Interp.vi						x
	X			No				SwerveDrivePoseEst2_InterpRecord_New.vi						x
	X			X				SwerveDrivePoseEst2_New.vi						x
	X			X				SwerveDrivePoseEst2_ResetPosition.vi						x
	X			X				SwerveDrivePoseEst2_SetVisionMeasurementStdDevs.vi						x
	X			X				SwerveDrivePoseEst2_Update.vi						x
	X			X				SwerveDrivePoseEst2_UpdateWithTime.vi						x
														x
														x

Revision 3.05 3/01/2023 – Added execute routines for state space sim and ctrl

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
UNSCENTED KALMAN FILTER	X	X		X				UnscentedKalmanFilter_Correct_FuncGroup.vi					
	X	X		X				UnscentedKalmanFilter_Correct_OnlyUY.vi					
	X	X		X				UnscentedKalmanFilter_Correct_OnlyUYR.vi					
	X	X		X				UnscentedKalmanFilter_Correct.vi					
	X	X		X				UnscentedKalmanFilter_GetP_Single.vi					
	X	X		X				UnscentedKalmanFilter_GetP.vi					
	X	X		X				UnscentedKalmanFilter_GetXHat_Single.vi					
	X	X		X				UnscentedKalmanFilter_GetXHat.vi					
	X	X		X				UnscentedKalmanFilter_New_Default.vi					
	X	X		X				UnscentedKalmanFilter_New_FuncGroup.vi					
	X	X		X				UnscentedKalmanFilter_New.vi					
	X	X		X				UnscentedKalmanFilter_Predict.vi					
	X	X		X				UnscentedKalmanFilter_Reset.vi					
	X	X		X				UnscentedKalmanFilter_SetP.vi					
	X	X		X				UnscentedKalmanFilter_SetXHat_Single.vi					
	X	X		X				UnscentedKalmanFilter_SetXHat.vi					
	X	X		X				UnscentedKalmanFilter_Transform.vi					

'============
STATE SPACE CONTROL
'============

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
CONTROL AFFINE PLANT INVERSION FEEDFORWARD													

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE ACCELERATION LIMITER	X	X		X		X		DiffDrvAccelLimit_Calculate.vi					
	X	X		X		X		DiffDrvAccelLimit_New.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
IMPLICIT MODEL FOLLOWER	X	X		X		X		ImplModelFollow_Calculate.vi					
	X	X		X		X		ImplModelFollow_GetU.vi					
	X	X		X		X		ImplModelFollow_GetU_Single.vi					
	X	X		X		X		ImplModelFollow_New.vi					
	X	X		X		X		ImplModelFollow_New_Plant.vi					
	X	X		X		X		ImplModelFollow_Reset.vi					

LINEAR PLANT INVERSION FEEDFORWARD

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
X	X		X				LinearPlntInvFF_Calculate_NextR.vi					
X	X		X				LinearPlntInvFF_Calculate.vi					
X	X		X				LinearPlntInvFF_GetR_Single.vi					
X	X		X				LinearPlntInvFF_GetR.vi					
X	X		X				LinearPlntInvFF_GetUff_Single.vi					
X	X		X				LinearPlntInvFF_GetUff.vi					
X	X		X				LinearPlntInvFF_New_Plant.vi					
X	X		X				LinearPlntInvFF_New.vi					
X	X		X				LinearPlntInvFF_Reset_Initial.vi					
X	X		X				LinearPlntInvFF_Reset_Zero.vi					

LINEAR QUADRATIC REGULATOR

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
X	X		X				LinearQuadraticRegulator_Calculate_NextR.vi					
X	X		X				LinearQuadraticRegulator_Calculate.vi					
X	X		X				LinearQuadraticRegulator_GetK_Single.vi		NOT ORIGINAL…			
X	X		X		X		LinearQuadraticRegulator_GetK.vi					
X	X		X				LinearQuadraticRegulator_GetR_Single.vi					
X	X		X				LinearQuadraticRegulator_GetR.vi					
X	X		X				LinearQuadraticRegulator_GetU_Single.vi					
X	X		X				LinearQuadraticRegulator_GetU.vi					
X	X		X		X		LinearQuadraticRegulator_LatencyCompensate.vi		Routine exists, but it only has interger raise matrix to power.			
X	X		X				LinearQuadraticRegulator_New_ELMS.vi					
X	X		X				LinearQuadraticRegulator_New_N.vi					
							LinearQuadraticRegulator_New_Raw.vi					
X	X		X		X		LinearQuadraticRegulator_New_SystemELMS.vi					
X	X		X				LinearQuadraticRegulator_New.vi					
X	X		X				LinearQuadraticRegulator_Reset.vi					

LINEAR SYSTEM

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
X	X		X	I			LinearSystem_CalculateX.vi					
X	X		X	I			LinearSystem_CalculateY.vi					
X	X		X	SI			LinearSystem_GetA.vi					
X	X		X	SI			LinearSystem_GetAElement.vi					
X	X		X	SI			LinearSystem_GetB.vi					
X	X		X	SI			LinearSystem_GetBElement.vi					
X	X		X	SI			LinearSystem_GetC.vi					
X	X		X	SI			LinearSystem_GetCElement.vi					
X	X		X	SI			LinearSystem_GetD.vi					
X	X		X	SI			LinearSystem_GetDElement.vi					
X	X		X	SI			LinearSystem_New.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
LINEAR SYSTEM LOOP	X	X		X				LinearSystemLoop_ClampInput.vi						x
	X	X		X				LinearSystemLoop_Correct.vi						x
	X		X	X				LinearSystemLoop_DCMotor_Execute.vi						x
	X		X	X				LinearSystemLoop_DCMotor_Pack_Ctrl.vi						x
	X		X	X				LinearSystemLoop_DiffDrv_Execute.vi						x
	X		X	X				LinearSystemLoop_DiffDrv_Pack_Ctrl.vi						x
	X		X	X				LinearSystemLoop_Elevator_Execute.vi						x
	X		X	X				LinearSystemLoop_Elevator_Pack_Ctrl.vi						x
	X		X	X				LinearSystemLoop_Execute.vi						x
	X		X	X				LinearSystemLoop_FlyWheel_Execute.vi						x
	X		X	X				LinearSystemLoop_FlyWheel_Pack_Ctrl.vi						x
								LinearSystemLoop_GetClampFunction.vi						x
	X	X		X				LinearSystemLoop_GetController.vi						x
	X	X		X				LinearSystemLoop_GetError_Single.vi						x
	X	X		X				LinearSystemLoop_GetError.vi						x
	X	X		X				LinearSystemLoop_GetFeedForward.vi						x
	X	X		X				LinearSystemLoop_GetNextR_Single.vi						x
	X	X		X				LinearSystemLoop_GetNextR.vi						x
	X	X		X				LinearSystemLoop_GetObserver.vi						x
	X	X		X				LinearSystemLoop_GetU_Row.vi						x
	X	X		X				LinearSystemLoop_GetU.vi						x
	X	X		X				LinearSystemLoop_GetXHat_Single.vi						x
	X	X		X				LinearSystemLoop_GetXHat.vi						x
								LinearSystemLoop_New_BBB						x
								LinearSystemLoop_New_LinearSystem_ClampFunc						x
	X	X		X				LinearSystemLoop_New_LinearSystem_ClampVal.vi						x
	X	X		X				LinearSystemLoop_New.vi						x
	X		X	X				LinearSystemLoop_Pack_Ctrl_Params.vi						x
	X	X		X				LinearSystemLoop_Predict.vi						x
	X	X		X				LinearSystemLoop_Reset.vi						x
								LinearSystemLoop_SetClampFunction.vi						x
								LinearSystemLoop_SetNextR_Some.vi						x
	X	X		X				LinearSystemLoop_SetNextR.vi						x
								LinearSystemLoop_SetXHat_Single.vi						x
								LinearSystemLoop_SetXHat.vi						x
	X		X	X				LinearSystemLoop_SngJntArm_Execute.vi						x
	X		X	X				LinearSystemLoop_SngJntArm_Pack_Ctrl.VI						x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
LTV DIFFERENTIAL DRIVE CONTROLLER	X	X		X				LTVDiffDriveCtrl_AtReference.vi						x
	X	X		X				LTVDiffDriveCtrl_Calculate_TrajState.vi						x
	X	X		X				LTVDiffDriveCtrl_Calculate.vi						x
	X		X	X				LTVDiffDriveCtrl_Execute.vi						x
	X	X		X				LTVDiffDriveCtrl_New.vi						x
	X		X	X				LTVDiffDriveCtrl_Pack_Ctrl_Params.vi						x
	X		X	X				LTVDiffDriveCtrl_Pack_Model_Params.vi						x
	X		X	X				LTVDiffDriveCtrl_Pack_Tolerance.vi						x
	X	X		X				LTVDiffDriveCtrl_SetTolerance.vi						x
	X		X	X				LTVUnicycleCtrl_Execute_TrajState.vi						x
														x
														x

Revision 3.05 3/01/2023 – Added execute routines for state space sim and ctrl

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
LTV UNICYCLE CONTROLLER	X	X		X		X		LTVUnicycleCtrl_AtReference.vi					
	X	X		X		X		LTVUnicycleCtrl_Calculate_TrajState.vi					
	X	X		X		X		LTVUnicycleCtrl_Calculate.vi					
	X		X	X				LTVUnicycleCtrl_Execute.vi					
	X		X	X				LTVUnicycleCtrl_Execute_TrajState.vi					
	X	X		X		X		LTVUnicycleCtrl_New.vi					
	X		X	X				LTVUnicycleCtrl_Pack_Model_Params.vi					
	X		X	X				LTVUnicycleCtrl_Pack_Tolerance.vi					
	X	X		X		X		LTVUnicycleCtrl_SetEnabled.vi					
	X	X		X		X		LTVUnicycleCtrl_SetTolerance.vi					

'============
STATE SPACE UTILITIES
'============

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
CALLBACK HELPER	X	X	X	X				CallbackHelp_MatrixMinus.vi					
	X	X	X	X				CallbackHelp_MatrixMult_CoerceSizeB.vi					
	X	X	X	X				CallbackHelp_MatrixMult.vi					
	X	X	X	X				CallbackHelp_MatrixPlus.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DISCRETIZATION	X	X		X		X		Discretization_DiscretizeA.vi					
	X	X		X		X		Discretization_DiscretizeAB.vi					
	X	X		X		X		Discretization_DiscretizeABTaylor.vi					
	X	X		X		X		Discretization_DiscretizeAQ.vi					
	X	X		X		X		Discretization_DiscretizeAQTaylor.vi					
	X	X		X				Discretization_DiscretizeR.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
STATE SPACE UTIL	X	X	X	No				StateSpaceUtil_Check_Stabalizable.vi		Internal routine			
	X	X		X				StateSpaceUtil_ClampInputMaxMagnitude.vi		Routine exists, it is just a shell			
	X	X		X				StateSpaceUtil_IsDetectable.vi					
	X	X		X				StateSpaceUtil_IsStabalizable.vi					
	X	X		X		X		StateSpaceUtil_MakeCostMatrix.vi					
	X	X		X		X		StateSpaceUtil_MakeCovarianceMatrix.vi					
	X	X		X				StateSpaceUtil_MakeWhiteNoiseVector.vi					
	X	X		X				StateSpaceUtil_NomalizeInputVector.vi					
	X	X		X				StateSpaceUtil_PoseTo3dVector.vi					
	X	X		X				StateSpaceUtil_PoseTo4dVector.vi					
	X	X		X				StateSpaceUtil_PoseToVector.vi					

'============
SIMULATION
'============

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
BATTERY SIM	X	X		X	SI			BatterySim_CalculateDefaultBatteryLoadedVoltage.vi					
	X	X		X	SI			BatterySim_CalculateLoadedVoltage.vi					
	X		X	X				BatterySim_Execute.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DC MOTOR SIM	X		X	X				DCMotorSim_Execute.vi					
	X	X		X				DCMotorSim_getAngularPositionRad.vi					
	X	X		X				DCMotorSim_getAngularPositionRotations.vi					
	X	X		X				DCMotorSim_getAngularVelocityRadPerSec.vi					
	X	X		X				DCMotorSim_getAngularVelocityRPM.vi					
	X	X		X				DCMotorSim_GetCurrentDrawAmps.vi					
	X	X		X				DCMotorSim_New_MOI.vi					
	X	X		X				DCMotorSim_New_Plant.vi					
	X		X	X				DCMotorSim_Pack_Simulation_Params.vi					
	X	X		X				DCMotorSim_SetInputVoltage.vi					
	X	X		X				DCMotorSim_Update.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE TRAIN SIM	X	X		X				DiffDriveTrainSim_ClampInput.vi					
	X	X		X				DiffDriveTrainSim_CreateKitbotSim_EstMass.vi					
	X	X		X				DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi					
	X	X		X				DiffDriveTrainSim_CreateKitbotSim.vi					
	X		X	X				DiffDriveTrainSim_Execute.vi					
	X	X		X				DiffDriveTrainSim_GetCurrentDrawAmps.vi					
	X	X		X				DiffDriveTrainSim_GetCurrentGearing.vi					
	X	X		X				DiffDriveTrainSim_GetDynamics.vi					
	X	X		X				DiffDriveTrainSim_GetHeading.vi					
	X	X		X				DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi					
	X	X		X				DiffDriveTrainSim_GetLeftPositionMeters.vi					
	X	X		X				DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi					
	X	X		X				DiffDriveTrainSim_GetOutput_Single.vi					
	X	X		X				DiffDriveTrainSim_GetPose.vi					
	X	X		X				DiffDriveTrainSim_GetRightCurrentDrawAmps.vi					
	X	X		X				DiffDriveTrainSim_GetRightPositionMeters.vi					
	X	X		X				DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi					
	X	X		X				DiffDriveTrainSim_GetState_Single.vi					
	X	X		X				DiffDriveTrainSim_GetState.vi					
	X	X		X				DiffDriveTrainSim_KitBotWheelSize.vi					
	X	X		X				DiffDriveTrainSim_New_Mass_MOI.vi					
	X	X		X				DiffDriveTrainSim_New.vi					
	X		X	X				DiffDriveTrainSim_Pack_Model_Params.vi					
	X		X	X				DiffDriveTrainSim_Pack_Simulation_Params.vi					
	X	X		X				DiffDriveTrainSim_SetCurrentGearing.vi					
	X	X		X				DiffDriveTrainSim_SetInputs.vi					
	X	X		X				DiffDriveTrainSim_SetPose.vi					

	X	X		X				DiffDriveTrainSim_SetState.vi						x
	X	X		X				DiffDriveTrainSim_ToughBoxMiniGearRatio.vi						x
	X	X		X				DiffDriveTrainSim_ToughBoxMiniMotor.vi						x
	X	X		X				DiffDriveTrainSim_Update.vi						x
														x
														x
														x

	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes	*Code Review*	*Test Program*	*Error Checking*	
ELEVATOR SIM	X		X	X				ElevatorSim_Execute.vi						x
	X	X		X				ElevatorSim_GetCurrentDraw.vi						x
	X	X		X				ElevatorSim_GetPositionMeters.vi						x
	X	X		X				ElevatorSim_GetVelocityMetersPerSecond.vi						x
	X	X		X				ElevatorSim_HasHitLowerLimit.vi						x
	X	X		X				ElevatorSim_HasHitUpperLimit.vi						x
								ElevatorSim_New_LinSys_NoNoise.vi						x
								ElevatorSim_New_LinSys.vi						x
								ElevatorSim_New_NoNoise.vi						x
	X	X		X				ElevatorSim_New.vi						x
	X		X	X				ElevatorSim_Pack_Simulation_Params.vi						x
	X	X	X	*No*				ElevatorSim_RKF45_Func.vi						x
	X	X		X				ElevatorSim_SetInputVoltage.vi						x
	X	X		X				ElevatorSim_SetState.vi						x
	X	X	X	X				ElevatorSim_Update.vi		Needed because this doesn't extend.				x
	X	X		X				ElevatorSim_UpdateX.vi						x
	X	X		X				ElevatorSim_WouldHitLowerLimit.vi						x
	X	X		X				ElevatorSim_WouldHitUpperLimit.vi						x
														x

	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes	*Code Review*	*Test Program*	*Error Checking*	
FLYWHEEL SIM	X		X	X				FlyWheelSim_Execute.vi						x
	X	X		X				FlyWheelSim_GetAngularVelocityRadPerSec.vi						x
	X	X		X				FlyWheelSim_GetAngularVelocityRPM.vi						x
	X	X		X				FlyWheelSim_GetCurrentDrawAmps						x
								FlyWheelSim_New_LinSys		Future				x
								FlyWheelSim_New_LinSys_MOI_NoNoise		Future				x
								FlyWheelSim_New_LinSys_NoNoise		Future				x
	X	X		X				FlyWheelSim_New_MOI.vi						x
			X					FlyWheelSim_Pack_Simulation_Params.vi						x
	X	X		X				FlyWheelSim_SetInput.vi						x
	X	X		X				FlyWheelSim_SetState.vi						x
	X	X		X				FlyWheelSim_Update.vi						x
														x
														x
														x

	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes	*Code Review*	*Test Program*	*Error Checking*	
LINEAR SYSTEM SIM	X	X		X				LinearSystemSim_ClampInput.vi						x
								LinearSystemSim_GetCurrentDrawAmps.vi		DONT IMPLEMENT…				x
	X	X		X				LinearSystemSim_GetOutput_Single.vi						x
	X	X		X				LinearSystemSim_GetOutput.vi						x
	X	X		X				LinearSystemSim_New						x
								LinearSystemSim_New_NoNoise.vi						x
	X	X		X				LinearSystemSim_SetInput_Array.vi		Doesn't use clamp ?				x
	X	X		X				LinearSystemSim_SetInput_Single.vi						x
	X	X		X				LinearSystemSim_SetInput.vi						x
	X	X		X				LinearSystemSim_Setstate.vi						x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
	X	X		X				LinearSystemSim_Update.vi						x
	X	X		No				LinearSystemSim_UpdateX.vi						x
	X	X	X	No				LinearSystemSim_UpdateY.vi						x
														x
														x
SINGLE JOINT ARM SIM	X	X		X				SngJntArmSim_EsitmateMOI.vi						x
	X		X	X				SngJntArmSim_Execute.vi						x
	X	X		X				SngJntArmSim_GetAngleRads.vi						x
	X	X		X				SngJntArmSim_GetCurrentDraw.vi						x
	X	X		X				SngJntArmSim_GetVelocityRadsPerSec.vi						x
	X	X		X				SngJntArmSim_HasHitLowerLimit.vi						x
	X	X		X				SngJntArmSim_HasHitUpperLimit.vi						x
	X	X		X				SngJntArmSim_New.vi						x
	X		X	X				SngJntArmSim_Pack_Simulation_Params.vi						x
	X	X		No				SngJntArmSim_Rkf45_Func.vi						x
	X	X		X				SngJntArmSim_SetInputVoltage.vi						x
	X	X		X				SngJntArmSim_SetState.vi						x
	X	X		X				SngJntArmSim_Update.vi						x
	X	X		X				SngJntArmSim_UpdateX.vi						x
	X	X		X				SngJntArmSim_WouldHitLowerLimit.vi						x
	X	X		X				SngJntArmSim_WouldHitUpperLimit.vi						x
														x
														x
														x
														x
														x
														x
														x

'============
MATRIX UTILITIES
'============

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
MAT BUILDER	X	X		X	SI			MatBuilder_Create.vi						x
	X	X		X	SI			MatBuilder_Fill.vi						x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
MATRIX	X	X		X	SI			Matrix_AssignBlock.vi						x
	X	X		X	SI			Matrix_Block.vi						x
								Matrix_ChangeBoundsUnchecked.vi						x
	X	X		X	SI			Matrix_Create.vi						x
								Matrix_Det.vi						x
	X	X		X	SI			Matrix_Diag.vi						x
								Matrix_Div_Scalar.vi		labview has function				x
								Matrix_ElementPower.vi						x
	X	X		X	SI			Matrix_ElementSum.vi						x
								Matrix_ElementTimes.vi						x
								Matrix_Equals.vi						x
	X	X		X	I			Matrix_Exp.vi						x
	X	X		X	SI			Matrix_ExtractColumnVector.vi						x
	X	X		X	SI			Matrix_ExtractFrom.vi						x
								Matrix_ExtractMatrix.vi						x
	X	X		X	SI			Matrix_ExtractRowVector.vi						x
	X	X		X	SI			Matrix_Fill.vi						x
								Matrix_Get.vi		labview has function				x
	X	X		X	I			Matrix_Ident.vi		WPILIB calls this EYE				x
								Matrix_Inv.vi						x

X	X		X	SI			Matrix_IsEqual.vi							x
							Matrix_IsIdentical.vi							x
X	X		X	I			Matrix_LLTDecompose.vi							x
							Matrix_Max.vi							x
							Matrix_MaxAbs.vi							x
							Matrix_Mean.vi							x
							Matrix_MinInternal.vi							x
							Matrix_Minus_Matrix.vi							x
							Matrix_Minus_Scalar.vi							x
X	X		X	I			Matrix_NormF.vi							x
							Matrix_NormIndP1.vi							x
							Matrix_Plus_Matrix.vi							x
							Matrix_Plus_Scalar.vi							x
X	X		X	I			Matrix_Pow.vi		THIS NEEDS WORK!!!!					x
X	X		X	SI			Matrix_SetColumn.vi							x
X	X		X	SI			Matrix_SetRow.vi	THERE ARE LOTS OF OTHER MATRIX FUNCTIONS THAT SHOULD BE INCLUDED HERE FOR ISOLATION.						x
							Matrix_Solve.vi							x
							Matrix_Times_Matrix.vi							x
							Matrix_Times_Scalar.vi							x
							Matrix_Trace.vi							x
X	X		X	SI			Matrix_Transpose.vi							x
X	X	X	X				Matrix_WithinTolerance.vi							x
														x
														x
														x

SIMPLE MATRIX

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
X	X		X	SI			SimpleMatrix_ExtractMatrix.vi		NOTE Matrix also has an ExtractMatrix with different calling parameters…. YUK.				x
													x

MATRIX HELPER

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
X	X	X	X	SI			MatrixHelper_CooerceSize.vi						x
X	X	X	X	SI			MatrixHelper_MultCooerceBSize.vi						x
X	X	X	X	SI			MatrixHelper_Zero.vi						x

VECTOR BUILDER

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
X	X		X	SI			VecBuilder_1x1Fill.vi						x
X	X		X	SI			VecBuilder_2x1Fill.vi						x
X	X		X	SI			VecBuilder_3x1Fill.vi						x
X	X		X	SI			VecBuilder_4x1Fill.vi						x
X	X		X	SI			VecBuilder_5x1Fill.vi						x
X	X		X	SI			VecBuilder_6x1Fill.vi						x
X	X		X	SI			VecBuilder_7x1Fill.vi						x
X	X		X	SI			VecBuilder_8x1Fill.vi						x
							VecBuilder_9x1Fill.vi						x
							VecBuilder_10x1Fill.vi						x
X	X	X	X	SI			VecBuilder_ArrayBy1Fill.vi						x
													x
													x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
VECTOR	X	X		X	SI			Vector_Dot.vi					
	X	X		X	Si			Vector_Norm.vi					

'============
MATH
'============

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
ANGLE STATISTICS	X	X	X	X	X			AngleStats_AngleAdd_CallbackHelp.vi					
	X	X		X	I	X		AngleStats_AngleAdd.vi					
	X	X	X	X	X			AngleStats_AngleMean_CallbackHelp.vi					
	X	X		X	I	X		AngleStats_AngleMean.vi					
	X	X	X	X	X			AngleStats_AngleResidual_CallbackHelp.vi					
	X	X		X	I	X		AngleStats_AngleResidual.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATH UTILITY	X	X		X	SI			MathUtil_AngleModulus.vi					
	X	X		X	SI			MathUtil_ApplyDeadband.vi					
	X	X		X	SI			MathUtil_Clamp_Int.vi					
	X	X		X	SI			MathUtil_Clamp.vi					
	X	X		X	SI			MathUtil_InputModulus.vi					
	X	X		X	Si			MathUtil_Interpolate.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
MERWE SCALED SIGMA POINTS	X	X		X	I			MerweScSigPts_ComputeWeights.vi					
	X	X		X	SI			MerweScSigPts_GetNumSigmas.vi					
	X	X		X	SI			MerweScSigPts_GetWc_Single.vi					
	X	X		X	SI			MerweScSigPts_GetWc.vi					
	X	X		X	SI			MerweScSigPts_GetWm_Single.vi					
	X	X		X	SI			MerweScSigPts_GetWm.vi					
	X	X		X	I			MerweScSigPts_New_Default.vi					
	X	X		X	I			MerweScSigPts_New.vi					
	X	X		X	I			MerweScSigPts_SigmaPoints.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
NUMERICAL INTEGRATION	X	X		X	I			NumIntegrate_Func_Ax_Bu_K.vi		NOT USED. Should this be used or abandoned???				x
	X	X		X				NumIntegrate_Rk4_Dbl_X_U.vi						x
	X	X		X				NumIntegrate_Rk4_Dbl_X.vi						x
	X	X		X				NumIntegrate_Rk4_Mat_X_U.vi						x
	X	X		X				NumIntegrate_Rk4_Mat_X.vi						x
	X	X		No	SI			NumIntegrate_Rkdp_Func_A.vi						x
	X	X		No	SI			NumIntegrate_Rkdp_Func_B1.vi						x
	X	X		No	SI			NumIntegrate_Rkdp_Func_B1B2.vi						x
	X	X		No	SI			NumIntegrate_Rkdp_Func_B2.vi						x
	X	X		No	I			Numintegrate_Rkdp_Impl.vi						x
	X	X		X				NumIntegrate_RKDP_Mat_X_U.vi		New replacement for RKF45				x
	X	X		No	SI			NumIntegrate_Rkf45_Func_A.vi						x
	X	X		No	SI			NumIntegrate_Rkf45_Func_B1.vi						x
	X	X		No	SI			NumIntegrate_Rkf45_Func_B1B2.vi						x
	X	X		No	SI			NumIntegrate_Rkf45_Func_B2.vi						x
								NumIntegrate_RKf45_Func_Bs.vi		Removed. Replaced with newer functions.				x
								NumIntegrate_RKf45_Func_Ch.vi		Removed. Replaced with newer functions.				x
								NumIntegrate_RKf45_Func_Ct.vi		Removed. Replaced with newer functions.				x
	X	X		No	I			NumIntegrate_Rkf45_Impl.vi						x
	X	X		X				NumIntegrate_Rkf45_Mat_X_U.vi		Note that this Feinberg method has been changed and a Dormand Price method has been implemented…. TODO				x
								NumIntegrate_RKf45_New.vi		Removed. Never used.				x
	X	X	X	X	SI			NumIntegrate_Trap_Dbl.vi						x
	X	X	X	X	I			NumIntegrate_Trap_Mat.vi						x
														x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
RUNGE KUTTA TIME VARYING	X	X		No				RungeKuttaTimeVarying_RK4_Mat_T_Y.vi						x
														x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
NUMERICAL JACOBIAN	X	X		X				NumJacobian_U.vi						x
	X	X		X				NumJacobian_X.vi						x
														x
														x
														x

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking	
RICCATI	X	X		X				Riccati_Check_Detectable.vi		Routine exists, it is just a shell				x
	X	X		X				Riccati_Check_Stabilizable.vi		Not really done !!!				x
								Riccati_DARE_Choose.vi		Intended to allow DARE method testing.				x
	X	X	X	X		X		Riccati_DARE_Iterate.vi						x
	X	X	X	X		X		Riccati_DARE_StructDoubling.vi						x
	X	X		X				Riccati_DARE_N.vi						x
	X	X		X		X		Riccati_DARE.vi						x
	X	X		X				Riccati_Input_Check.vi						x
														x
														x
														x

'============
VISION

'============

COMPUTER VISION UTILITIES

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
X	X		X				CompVisionUtil_CalculateDistanceToTarget.vi					
X	X		X				CompVisionUtil_EstimateCameraToTarget.vi					
X	X		X				CompVisionUtil_EstimateFieldToCamera.vi					
X	X		X				CompVisionUtil_EstimateFieldToRobot.vi					
X	X		X				CompVisionUtil_EstimateFieldToRobot_Alt.vi					
X	X		X				CompVisionUtil_ObjectToRobotPose.vi					

APRIL TAG

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
X	X		X	SI			AprilTag_Equals.vi					
X	X	X	X	SI			AprilTag_GetAll.vi					
X	X		X	SI			AprilTag_New.vi					

APRIL TAG FIELD LAYOUT

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
X	X		X	SI			AprilTagFieldLayout_GetField.vi					
X	X		X	SI			AprilTagFieldLayout_GetOriginPosition.vi					
X	X		X	SI			AprilTagFieldLayout_GetTagPose.vi					
X	X		X	SI			AprilTagFieldLayout_GetTags.vi					
X	X		X	SI			AprilTagFieldLayout_New.vi					
X	X		X	SI			AprilTagFieldLayout_New2022.vi					
X	X		X	SI			AprilTagFieldLayout_New2023.vi					
X	X		X	SI			AprilTagFieldLayout_NewSelect.vi					
X	X		X	SI			AprilTagFieldLayout_SetOrigin.vi					
X	X		X	SI			AprilTagFieldLayout_SetOrigin_Position.vi					

APRIL TAG POSE ESTIMATE

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
X	X		X	SI			AprilTagPoseEstimate_GetAll.vi					
X	X		X	SI			AprilTagPoseEstimate_GetAmbiguity.vi					
X	X		X	SI			AprilTagPoseEstimate_New.vi					

'============
COMMUNICATIONS
'============

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
NETWORK UDP	X	X	X	X	S/			NetworkUDP_Close.vi					
	X	X	X	X	/			NetworkUDP_Receive.vi					
	X	X	X	X	/			NetworkUDP_Send.vi					

'============
TYPE DEFINITIONS
'============

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
TypeDef	Z	Z	X	X	N/A			AprilTag.ctl					
	Z	Z	X	X	N/A			AprilTagFieldLayout,ctl					
	Z	Z	X	X	N/A			AprilTagFieldLayoutOriginPosition_ENUM.ctl					
	Z	Z	X	X	N/A			AprilTagFields_ENUM.ctl					
	Z	Z	X	X	N/A			AprilTagPoseEstimate.ctl					
	Z	Z	X	X	N/A			ARM_FF.CTL					
	Z	Z	X	X	N/A			BANG_BANG.CTL					
	\		X	X	N/A			BICon-Matrix_FUNC_TYPE.CTL		NOT USED. Should this be deleted or abandoned???			
	Z	Z	X	X	N/A			CALLBACK_FUNC_TYPE.CTL					
	Z	Z	X	X	N/A			CHASSIS_SPEEDS.CTL					
	Z	Z	X	X	N/A			CONTRAINED_STATE.CTL					
	Z	Z	X	X	N/A			COORDINATE_AXIS.CTL					
	Z	Z	X	X	N/A			COORDINATE_SYSTEM.CTL					
	Z	Z	X	X	N/A			DCMOTOR_SIM.CTL					
	/		/		/			DCMOTOR_SIM_MODEL_PARAMS.CTL		OBSOLETE – Removed			
	Z		Z	X	N/A			DCMOTOR_SIM_SIMULATION_PARAMS.CTL					
	Z	Z	X	X	N/A			DCMOTOR_TYPES_ENUM.CTL					
	Z	Z	X	X	N/A			DCMOTOR.CTL					
	Z	Z	X	X	N/A			DEBOUNCER_TYPE_ENUM.Ctl					
	Z	Z	X	X	N/A			DEBOUNCER.CTL					
	Z	Z	X	X	N/A			DIFF_DRIVE_ACCEL_LIMIT.CTL					
	Z	Z	X	X	N/A			DIFF_DRIVE_KINEMATICS.CTL					
	Z	Z	X	X	N/A			DIFF_DRIVE_Kitbot_WheelSize_ENUM.ctl					
	Z	Z	X	X	N/A			DIFF_DRIVE_ODOM2.ctl					
	Z	Z	X	X	N/A			DIFF_DRIVE_Pose_EST.ctl					
	Z		X	X	N/A			DIFF_DRIVE_POSE_EST2.ctl					
	Z		X	No	N/A			DIFF_DRIVE_POSE_EST2_INTERP_RECORD.CTL					
	Z	Z	X	X	N/A			DIFF_DRIVE_ToughBoxMini_GearChoice_ENUM.ctl					
	Z	Z	X	X	N/A			DIFF_DRIVE_ToughBoxMini_MotorChoice_ENUM.ctl					
	Z		Z	X	N/A			DIFF_DRIVE_SIM_MODEL_PARAMS					
	Z		Z	X	N/A			DIFF_DRIVE_SIM_SIMULATION_PARAMS.CTL					
	Z	Z	X	X	N/A			DIFF_DRIVE_TRAIN_SIM_STATE_ENUM.CTL					
	Z	Z	X	X	N/A			DIFF_DRIVE_TRAIN_SIM.ctl					
	Z	Z	X	X	NA			DISPLAY_WAYPOINT.ctl		Was UTIL_WAYPOINT.VI			
	Z	Z	X	X	NA			DISPLAY_WEIGHTED_WAYPOINT.ctl		New V1.5. was UTIL_WEIGHTED_WAYPOINIT.VI			
	Z	Z	X	X	N/A			ELEV_FF.CTL					
	Z	Z	X	X	N/A			ELEVATOR_SIM.CTL					
	Z		Z	X	N/A			ELEVATOR_SIM_SIMULATION_PARAMS.CTL					
	Z	Z	X	X	N/A			EXTENDED_KALMAN_CORRECT_FUNC_GROUP.CTL					
	Z		X	X	N/A			EXTENDED_KALMAN_FILTER.CTL					
	Z	Z	X	X	N/A			FLYWHEEL_SIM.ctl					
	Z		Z	X	N/A			FLYWHEEL_SIM_SIMULATION_PARAMS.CTL					
	Z	Z	X	X	N/A			FUNCTION_GENERATOR_MATRIX.ctl					
	Z	Z	X	X	N/A			FUNCTION_GENERATOR.ctl					

Z	Z	X	X	N/A			HOLONOMIC_DRV_CTRL.CTL		New 1/26/21	x
Z	Z	X	X	N/A			KALMAN_FILTER_LATENCY_COMP_FUNC_GROUP.CTL			x
Z	Z	X	X	N/A			KALMAN_FILTER_LATENCY_COMP.CTL			x
Z	Z	X	X	N/A			KALMAN_FILTER.ctl			x
Z	Z	X	X	N/A			LINEAR_FILTER.CTL			x
Z	Z	X	X	N/A			LINEAR_PLANT_INV_FF.ctl			x
Z	Z	X	X	N/A			LINEAR_QUADRATIC_REGULATOR.ctl			x
Z		Z	X	N/A			LINEAR_SYSTEM_ID_DCMOTOR_MODEL.CTL			x
Z		Z	X	N/A			LINEAR_SYSTEM_ID_ELEVATOR_MODEL.CTL			x
Z		Z	X	N/A			LINEAR_SYSTEM_ID_FLYWHEEL_MODEL.CTL			x
Z		Z	X	N/A			LINEAR_SYSTEM_ID_SINGLE_JOINT_ARM_MODEL.CTL			x
Z	Z	X	X	N/A			LINEAR_SYSTEM_LOOP.ctl			x
Z		Z	X	N/A			LINEAR_SYSTEM_LOOP_CTRL_PARAMS.CTL			x
Z		Z	X	N/A			LINEAR_SYSTEM_LOOP_DCMOTOR_CTRL_PARAMS.CL			x
Z		Z	X	N/A			LINEAR_SYSTEM_LOOP_DIFF_DRV_CTRL_PARAMS.CTL			x
Z		Z	X	N/A			LINEAR_SYSTEM_LOOP_ELEVATOR_CTRL_PARAMS.CTL			x
Z		Z	X	N/A			LINEAR_SYSTEM_LOOP_FLYWHEEL_CTRL_PARAMS.CTL			x
Z		Z	X	N/A			LINEAR_SYSTEM_LOOP_SNGJNTARM_CTRL_PARAMS.CTL			x
Z	Z	X	X	N/A			LINEAR_SYSTEM_SIM.ctl			x
Z	Z	X	X	N/A			LINEAR_SYSTEM.ctl			x
Z		Z	X	N/A			LTV_DIFF_DRIVE_CTRL_CONTROL_PARAMS.CTL			x
Z		Z	X	N/A			LTV_DIFF_DRIVE_CTRL_MODEL_PARAMS.CTL			x
Z	Z	X	X	N/A			LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl			x
Z		Z	X	N/A			LTV_DIFF_DRIVE_CTRL_TOLERANCE.CTL			x
Z	Z	X	X	N/A			LTV_DIFF_DRIVE_CTRL.ctl			x
Z		Z	X	N/A			LTV_UNICYCLE_CONTROLLER_MODEL_PARAMS.CTL			x
Z	Z	X	X	N/A			LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl			x
Z		Z	X	N/A			LTV_UNICYCLE_CONTROLLER_TOLERANCE.CTL			x
Z	Z	X	X	N/A			LTV_UNICYCLE_CONTROLLER.CTL			x
Z	Z	X	X	N/A			MECA_DRIVE_KINEMATICS.CTL			x
Z	Z	X	X	N/A			MECA_DRIVE_ODOMETRY.CTL			x
Z	Z	X	X	N/A			MECA_DRIVE_POSE_EST.CTL			x
Z		X	X	N/A			MECA_DRIVE_POSE_EST2.ctl			x
Z		X	X	N/A			MECA_DRIVE_POSE_EST2_INTERP_RECORD.CTL			x
Z	Z	X	X	N/A			MECA_WHEEL_POSITIONS.CTL			x
Z	Z	X	X	N/A			MECA_WHEEL_SPEEDS.CTL			x
Z	Z	X	X	N/A			MEDIAN_FILTER.CTL			x
Z	Z	X	X	N/A			MERWE_SCALED_SIGMA_PTS.ctl			x
Z	Z	X	X	N/A			OBSERVER_SNAP_LIST_ITEM.CTL			x
Z	Z	X	X	N/A			OBSERVER_SNAPSHOT.CTL			x
Z	Z	X	X	N/A			PARAM_STACK_ITEM.CTL			x
Z	Z	X	X	N/A			PARAM_STACK.CTL			x
Z	Z	X	X	N/A			PID_ADV_LIMITS.CTL			x
Z	Z	X	X	N/A			PID_ADV_TUNING.CTL			x
Z	Z	X	X	N/A			PID_CONTROLLER.CTL			x
Z	Z	X	X	N/A			PID_ERROR_TOLERANCE.CTL			x
Z	Z	X	X	N/A			PID_INPUT_LIMITS.CTL			x
Z	Z	X	X	N/A			PID_TUNING.CTL			x
Z	Z	X	X	N/A			POSE2D.CTL			x
Z	Z	X	X	N/A			POSE3D.CTL			x
Z	Z	X	X	N/A			POSEwCURVATURE.CTL			x
Z	Z	X	X	N/A			PROFILED_PID_CONTROLLER.CTL			x
Z	Z	X	X	N/A			QUATERNION.CTL			x
Z	Z	X	X	N/A			RAMSETE_EXE_TUNING.CTL			x
Z	Z	X	X	N/A			RAMSETE.CTL			x
Z	Z	X	X	N/A			ROTATION2D.CTL			x
Z	Z	X	X	N/A			ROTATION3D.CTL			x
Z	Z	Z	X	N/A			SIMPLE_MOTOR_FF_KA_TUNE_PARAMS.CTL			x
Z	Z	X	X	N/A			SIMPLE_MOTOR_FF.CTL			x
Z	Z	X	X	N/A			SINGLE_JOINT_ARM_SIM.CTL			x
Z		X	X	N/A			SINGLE_JOINT_ARM_SIM_SIMULATION_PARAMS.CTL			x
Z	Z	X	X	N/A			SLEW_RATE_LIMITER.CTL			x
Z	Z	X	X	N/A			SPLINE_CTRL_VECTOR.CTL			x
Z	Z	X	X	N/A			SPLINE.CTL			x
Z	Z	X	X	N/A			SWERVE_DRIVE_KINEMATICS.CTL			x
Z	Z	X	X	N/A			SWERVE_DRIVE_MODULE_POSITION.CTL			x
Z	Z	X	X	N/A			SWERVE_DRIVE_MODULE_STATE.CTL			x
Z	Z	X	X	N/A			SWERVE_DRIVE_ODOMETRY.CTL			x
Z	Z	X	X	N/A			SWERVE_DRIVE_Pose_EST.CTL			x
Z		X	X	N/A			SWERVE_DRIVE_POSE_EST2.ctl			x
Z		X	No	N/A			SWERVE_DRIVE_POSE_EST2_INTERP_RECORD.CTL			x

Z	Z	X	X	N/A			TIME_INTERPOLATABLE_BOOLEAN.CTL			x
Z	Z	X	X	N/A			TIME_INTERPOLATABLE_DOUBLE.CTL			x
Z	Z	X	X	N/A			TIME_INTERPOLATABLE_POSE2D.CTL			x
Z	Z	X	X	N/A			TIME_INTERPOLATABLE_ROTATION2D.CTL			x
Z	Z	Z	X	N/A			TIME_INTERPOLATABLE_VARIANT.CTL			x
Z	Z	X	X	N/A			TIMER.CTL			x
Z	Z	X	X	N/A			TRAJ_CONFIG.CTL			x
Z	Z	X	X	N/A			TRAJ_CONSTRAINT_CENTRIPETAL_ACCEL.CTL			x
Z	Z	X	X	N/A			TRAJ_CONSTRAINT_DIIF_DRIVE_KINEMATICS.CTL			x
Z	Z	X	X	N/A			TRAJ_CONSTRAINT_DIIF_DRIVE_VOLTAGE.CTL			x
Z	Z	X	X	N/A			TRAJ_CONSTRAINT_ELLIP_REGION.CTL			x
\		X		N/A			TRAJ_CONSTRAINT_JERK.CTL		Routine exists, it is just a shell	x
Z	Z	X	X	N/A			TRAJ_CONSTRAINT_MAX_VELOCITY.CTL			x
Z	Z	X	X	N/A			TRAJ_CONSTRAINT_MECA_DRIVE_KINEMATICS.CTL			x
Z	Z	X	X	N/A			TRAJ_CONSTRAINT_MINMAX.CTL			x
Z	Z	X	X	N/A			TRAJ_CONSTRAINT_RECT_REGION.CTL			x
Z	Z	X	X	N/A			TRAJ_CONSTRAINT_SWERVE_DRIVE_KINEMATICS.CTL			x
Z	Z	X	X	N/A			TRAJ_STATE.CTL			x
Z	Z	X	X	N/A			TRAJECTORY_SPLINE_TYPE_ENUM.CTL			x
Z	Z	X	X	N/A			TRAJECTORY.CTL			x
Z	Z	X	X	N/A			TRANSFORM2D.CTL			x
Z	Z	X	X	N/A			TRANSFORM3D.CTL			x
Z	Z	X	X	N/A			TRANSLATION2D.CTL			x
Z	Z	X	X	N/A			TRANSLATION3D.CTL			x
Z	Z	X	X	N/A			TRAPEZOID_PROFILE_CONSTRAINT.CTL			x
Z	Z	X	X	N/A			TRAPEZOID_PROFILE_STATE.CTL			x
Z	Z	X	X	N/A			TRAPEZOID_PROFILE.CTL			x
Z	Z	X	X	N/A			TWIST2D.CTL			x
Z	Z	X	X	N/A			TWIST3D.CTL			x
Z	Z	X	X	N/A			UNSCENTED_KALMAN_CORRECT_FUNC_GROUP.CTL			x
Z	Z	X	X	N/A			UNSCENTED_KALMAN_FILTER.ctl			x
Z	Z	X	X	N/A			UNSCENTED_KALMAN_NEW_FUNC_GROUP.CTL			x
Z	Z	X	X	N/A			UTIL_PATHFINDER_CONFIG.CTL			x
N/A		N/A		N/A			WAYPOINTS.CTL		Delete – obsolete	x
Z	Z	X	X	NA			WEIGHTED_WAYPOINT.CTL		New V1.5	x
N/A		N/A		N/A			X_Y_HEADINGS.CTL		Delete – obsolete	x
Z	Z	X	X	N/A			X_Y_PAIR.CTL			x