FRC LabVIEW Trajectory Library – VI Implementation List

Revision 2.X   11/06/2022 – added various routines

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	1084	1076	335	1022	608	49	12	Doc completed Pct	99.26%
VI Total (X)	974	967						Optimization Pct	
CTL Total (Z)	110	109						56.09%	
VI Shell Total (/)	3								
CTRL Shell Total (\)	2								

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

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
ANALOG DELAY	X	X	X	X	I			AnalogDelay.vi		Similar to interpolated tree map..			

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
BUMPLESS TRANSFER	X		X	X				BumplessTransfer_Execute.vi		Similar to interpolated tree map..			

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
FUNCTION GENERATOR	X	X		X	I			FunctionGenerator_Add_Value.vi		Similar to interpolated tree map..			
	X	X		X	I			FunctionGenerator_Add_XY.vi		Similar to interpolated tree map..			
	X	X		X	I			FunctionGenerator_Calculate.vi		Similar to interpolated tree map..			
	X	X		X	SI			FunctionGenerator_Clear.vi					
	X	X	X	X	I			FunctionGenerator_Execute.vi		Similar to interpolated tree map..			
	X	X		X	SI			FunctionGenerator_New.vi		Similar to interpolated tree map..			

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
FUNCTION GENERATOR MATRIX	X	X	X	X	I			FunctionGeneratoMatrixr_Add.vi		Similar to interpolated tree map..			
	X	X	X	X	I			FunctionGenerator_Calculate.vi		Similar to interpolated tree map..			

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			FunctionGenerator_New.vi		Similar to interpolated tree map..			

LEAD LAG

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				LeadLag_Execute.vi		Similar to interpolated tree map..			

LINEAR FILTER

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			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			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	X			LinearFilter_SinglePoleIIR.vi					
X	X	X	X	X			LinearFilter_TimeConst.vi					

MEDIAN FILTER

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			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					

SLEW RATE FILTER

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			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					

Revision 2.X   11/06/2022 – added various routines

TIMER

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				Timer_Close.vi		releases semaphore			
X	X		X			X	Timer_Get.vi					
X	X	X	X				Timer_GetAndReset.vi					
X	X	X	No				Timer_GetInternal.vi		Internal (private) only			
X	X		X			X	Timer_HasPeriodPassed.vi					
X	X	X	X			X	Timer_HasPeriodPassedOnce.vi					
X	X		X			X	Timer_New.vi					
X	X		X			X	Timer_Reset.vi					
X	X	X	No				Timer_ResetInternal		Internal (private) only			
X	X		X			X	Timer_Start.vi					
X	X		X			X	Timer_Stop.vi					
X	X	X	No				Timer_StopInternal.vi		Internal (private) only			

TIME INTERPOLATABLE BOOLEAN

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			TimeInterpBoolean_AddSample.vi		Update to use create matrix			
X	X	X	No	I			TimeInterpBoolean_CleanUp.vi		Update to use create matrix			
X	X	X	X	SI			TimeInterpBoolean_Clear.vi					
X	X	X	X	I			TimeInterpBoolean_GetSample.vi					
X	X	X	X	SI			TimeInterpBoolean_New.vi					
X	X	X	X	SI			TimeInterpBoolean_SetMaxTime.vi					

TIME INTERPOLATABLE DOUBLE

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			TimeInterpDouble_AddSample.vi		Update to use create matrix			
X	X	X	No	I			TimeInterpDouble_CleanUp.vi		Update to use create matrix			
X	X	X	X	SI			TimeInterpDouble_Clear.vi					
X	X	X	X	I			TimeInterpDouble_GetSample.vi					
X	X	X	X	SI			TimeInterpDouble_New.vi					
X	X	X	X	SI			TimeInterpDouble_SetMaxTime.vi					

TIME INTERPOLATABLE POSE2D

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			TimeInterpPose2d_AddSample.vi		Update to use create matrix			
X	X	X	No	I			TimeInterpPose2d_CleanUp.vi		Update to use create matrix			
X	X	X	X	SI			TimeInterpPose2d_Clear.vi					
X	X	X	X	I			TimeInterpPose2d_GetSample.vi					
X	X	X	X	SI			TimeInterpPose2d_New.vi					
X	X	X	X	SI			TimeInterpPose2d_SetMaxTime.vi					

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	I			TimeInterpRotation2d_GetSample.vi					
X	X	X	X	SI			TimeInterpRotation2d_New.vi					
X	X	X	X	SI			TimeInterpRotation2d_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				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					

'===========
CONTROLLER
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ARM FF

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				ArmFF_Calculate.vi					
X	X		X				ArmFF_CalculateVelocityOnly.vi					
		X					ArmFF_Execute.vi		LabVIEW style single call			

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

BANG BANG

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			BangBang_AtSetpoint.vi					
X	X		X	SI			BangBang_Calculate_PV.vi					
X	X		X	SI			BangBang_Calculate_SP_PV.vi					
X	X	X	X	SI			BangBang_Execute.vi					
X	X		X	SI			BangBang_GetAll.vi					
X	X		X	SI			BangBang_GetError.vi					
X	X		X	SI			BangBang_New.vi					
X	X		X	SI			BangBang_SetSetpoint.vi					
X	X		X	SI			BangBang_SetTolerance.vi					

CONTROLLER UTIL

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			ControllerUtil_GetModulusError.vi		This was short lived in WPILIB, but still useful here.			

ELEV FF

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				ElevFF_Calculate.vi					
X	X		X				ElevFF_CalculateVelocityOnly.vi					
		X					ElevFF_Execute.vi		LabVIEW style single call			
		X					ElevFF_ExecuteVelocityOnly.vi		LabVIEW style single call			
X	X		X				ElevFF_MaxAchieveAccel.vi					
X	X		X				ElevFF_MaxAchieveVelocity.vi					
X	X		X				ElevFF_MinAchieveAccel.vi					
X	X		X				ElevFF_MinAchieveVelocity.vi					
X	X		X				ElevFF_New_ZeroAccel.vi					
X	X		X				ElevFF_New.vi					

HOL_DRV_CTRL

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				HolDrvCtrl_AdvCalculate_Trajectory.vi		Added 1/24/2022			
X	X	X	X				HolDrvCtrl_AdvCalculate.vi		Added 1/24/2022			
X	X		X	SI			HolDrvCtrl_AtReference.vi		Added 1/26/21			
X	X		X	I			HolDrvCtrl_Calculate_Trajectory.vi		Added 1/26/21			
X	X		X	I			HolDrvCtrl_Calculate.vi		Added 1/26/21			
X	X	X	X				HolDrvCtrl_Execute_Trajectory.vi		Added 1/24/2022			

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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				HolDrvCtrl_Execute.vi		Future			
X	X		X	SI			HolDrvCtrl_New.vi		Added 1/26/21			
X	X	X	X	SI			HolDrvCtrl_PackExecuteSP.vi					
X	X	X	X				HolDrvCtrl_PackPID.vi		Added 1/24/2022			
X	X	X	X				HolDrvCtrl_PackProfPID.vi		Added 1/24/2022			
X	X		X	SI			HolDrvCtrl_SetEnabled.vi		Added 1/26/21			
X	X		X	SI			HolDrvCtrl_SetTolerance.vi		Added 1/26/21			

PID AUTOTUNE

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	No				PIDAutoTune_ClosedLoopStep.vi					
X		X	No				PIDAutoTune_Convert_Academic_To_NonInteracting.vi					
x		X	No				PIDAutoTune_OpenLoopStep.vi					
X		X	X				PIDAutoTune_SetTuningArguments.vi					
X		X	X				PIDAutoTune_Step.vi					

PID CONTROLLER

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				PIDController_AdvCalculate_FF_Sp_Pv_Per.vi		Advanced PID			
X	X	X	X				PIDController_AdvCalculate_FF_Sp_Pv.vi		Advanced PID			
X	X	X	X			X	PIDController_AdvExecute.vi		Labview style helper. Advanced PID			
X	X		X	SI			PIDController_AtSetpoint.vi					
X	X		X				PIDController_Calculate_PV.vi					
X	X		X				PIDController_Calculate_SP_PV.vi					
X	X		X	SI			PIDController_DisableContinousInput.vi					
X	X		X	SI			PIDController_EnableContinousInput.vi					
X	X	X	X			X	PIDController_Execute.vi		Labview style helper			
							PIDController_GetContinuousError.vi		OBSOLETE – Removed			
X	X		X	SI			PIDController_GetPeriod.vi					
X	X		X	SI			PIDController_GetPID.vi					
X	X		X	SI			PIDController_GetPositionError.vi					
X	X		X	SI			PIDController_GetSetpoint.vi					
X	X			SI			PIDController_GetTolerance.vi					
X	X		X	SI			PIDController_GetVelocityError.vi					
X	X		X	SI			PIDController_IsContinuousInputEnabled.vi					
X	X		X	I			PIDController_New.vi					
X	X		X	I			PIDController_NewPeriod.vi					
X	X	X	X	SI			PIDController_Pack_AdvLimits.vi					
X	X	X	X	SI			PIDController_Pack_AdvTuning.vi					
X	X	X	X	SI			PIDController_Pack_ErrorTolerance.vi					
X	X	X	X	SI			PIDController_Pack_InputLimits.vi					
X	X	X	X	SI			PIDController_Pack_Tuning.vi					
X	X		X	SI			PIDController_Reset.vi					
X	X		X	SI			PIDController_SetD.vi					
X	X	X	X	SI			PIDController_SetDerivativeFilter.vi		Advanced PID			
X	X	X	No				PIDController_SetFeedForward_OBSOLETE_DELETE.vi		Advanced PID, Obsolete – DELETE			
X	X	X	No				PIDController_SetFFGain_OBSOLETE_DELETE.vi		Advanced PID, Obsolete – DELETE			
X	X		X	SI			PIDController_SetI.vi					
							PIDController_SetInputRange.vi		OBSOLETE – Removed			
X	X		X	SI			PIDController_SetIntegratorRange.vi					
X	X	X	X	SI			PIDController_SetOutputLimits.vi		Advanced PID			
X	X		X	SI			PIDController_SetP.vi					
X	X	X	X	SI			PIDController_SetPeriod.vi					
X	X		X	SI			PIDController_SetPID.vi					

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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			PIDController_SetPIDF.vi		Advanced PID			
X	X		X	SI			PIDController_SetSetpoint.vi					
X	X		X	SI			PIDController_SetTolerance.vi					
X	X		X	SI			PIDController_SetTolerancePandV.vi					

PROFILED PID CONTROLLER

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			ProfiledPIDController_AtGoal.vi					
X	X		X	SI			ProfiledPIDController_AtSetpoint.vi					
X	X		X				ProfiledPIDController_Calculate_Meas_Goal.vi					
X	X		X				ProfiledPIDController_Calculate_Meas_StateGoal_TrapCnsrt.vi					
X	X		X				ProfiledPIDController_Calculate_Meas_StateGoal.vi					
X	X		X				ProfiledPIDController_Calculate_Meas.vi					
X	X		X	SI			ProfiledPIDController_DisableContInput.vi					
X	X		X	SI			ProfiledPIDController_EnableContInput.vi					
X	X	X	X	I			ProfiledPIDController_Execute.vi		Single call LabVIEW style function.			
X	X		X	SI			ProfiledPIDController_GetGoal.vi					
X	X		X	SI			ProfiledPIDController_GetPeriod.vi					
X	X	X	X	SI			ProfiledPIDController_GetPID.vi		WPILIB has separate getters.			
X	X		X	SI			ProfiledPIDController_GetPositionError.vi					
X	X		X	SI			ProfiledPIDController_GetSetpoint.vi					
X	X			SI			ProfiledPIDController_GetTolerance.vi					
X	X		X	SI			ProfiledPIDController_GetVelocityError.vi					
X	X		X	I			ProfiledPIDController_New.vi					
X	X		X	I			ProfiledPIDController_NewPeriod.vi					
X	X		X	SI			ProfiledPIDController_Reset_PosOnly.vi					
X	X		X	SI			ProfiledPIDController_Reset_PosVel.vi					
X	X		X	SI			ProfiledPIDController_Reset.vi					
X	X		X	SI			ProfiledPIDController_SetConstraints.vi					
X	X		X	SI			ProfiledPIDController_SetGoal_PosOnly.vi					
X	X		X	SI			ProfiledPIDController_SetGoal.vi					
X	X		X	SI			ProfiledPIDController_SetIntegratorRange.vi					
X	X		X	SI			ProfiledPIDController_SetPID.vi					
X	X		X	SI			ProfiledPIDController_SetTolerance_PosOnly.vi					
X	X		X	SI			ProfiledPIDController_SetTolerance_PosVel.vi					

RAMSETE

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			Ramsete_AtReference.vi	AtReference				
X	X		X	X			Ramsete_Calculate_Trajectory.vi	calculate_trajectory				
X	X		X	X			Ramsete_Calculate.vi	calculate				
X	X	X	X	X			Ramsete_Diff_DO_Eng.vi					
X	X	X	X	X			Ramsete_Diff_DO_SI.vi					
X	X	X	X	I			Ramsete_Execute_ENG.vi	Use this one!!				
X	X	X	X	SI			Ramsete_Execute_PackTuning_ENG.vi					
X	X	X	X	SI			Ramsete_Execute_PackTuning.vi					
X	X	X	X	I			Ramsete_Execute.vi					
X	X		X	SI			Ramsete_New_B_Z.vi	new(b, zeta)				
X	X		X	SI			Ramsete_New.vi	new				
X	X		X	SI			Ramsete_SetEnabled.vi	SetEnabled				
X	X		X	SI			Ramsete_SetTolerance.vi	SetTolerance				
X	X		X	X			Ramsete_SINC.vi	sinc	internal			

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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				SimpleMotorFF_Calculate_NextV_Dt.vi					
X	X		X	SI			SimpleMotorFF_Calculate.vi	public double calculate(double velocity, double acceleration)				
X	X		X	SI			SimpleMotorFF_CalculateVelocityOnly.vi	public double calculate(double velocity)				
X	X		X	X			SimpleMotorFF_MaxAchieveAccel.vi	public double maxAchievableAcceleration(double maxVoltage, double velocity)				
X	X		X	X			SimpleMotorFF_MaxAchieveVel.vi	public double maxAchievableVelocity(double maxVoltage, double acceleration)				
X	X		X	X			SimpleMotorFF_MinAchieveAccel.vi	public double minAchievableAcceleration(double maxVoltage, double velocity)				
X	X		X	X			SimpleMotorFF_MinAchieveVel.vi	public double minAchievableVelocity(double maxVoltage, double acceleration)				
X	X		X	SI			SimpleMotorFF_New.vi	public SimpleMotorFeedforward(double ks, double kv, double ka)				
								public SimpleMotorFeedforward(double ks, double kv)				

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GEOMETRY
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COORDINATE AXIS

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			CoordAxis_D.vi					
X	X		X	SI			CoordAxis_E.vi					
X	X		X	SI			CoordAxis_N.vi					
X	X		X	SI			CoordAxis_New.vi					
X	X		X	SI			CoordAxis_S.vi					
X	X		X	SI			CoordAxis_U.vi					
X	X		X	SI			CoordAxis_W.vi					

COORDINATE 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	SI	X		CoordSystem_Convert_Pose3d.vi					
X	X		X	SI			CoordSystem_Convert_Rotation3d.vi					
X	X		X	SI			CoordSystem_Convert_Translation3d.vi					
X	X		X	SI			CoordSystem_Convert_Transform3d.vi					
X	X		X	SI	X		CoordSystem_EDN.vi					
X	X		X	SI	X		CoordSystem_NED.vi					
X	X		X	SI	X		CoordSystem_New.vi					
X	X		X	SI	X		CoordSystem_NWU.vi					

POSE2D

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			Pose2d_Equals.VI	boolean equals(other obj)				
X	X		X	X			Pose2d_Exp.vi	pose2d exp(twist2d twist)				
X	X		X	SI			Pose2d_getRotation.vi	rotation2d getRotation()	can also use cluster unpack			

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			Pose2d_getTranslation.vi	translation2d getTranslation()	can also use cluster unpack			
X	X	X	X	SI			Pose2d_getXY.vi					
X	X	X	X	SI			Pose2d_getXYAngle.vi					
X	X		X	I			Pose2d_Interpolate.vi					
X	X		X	X			Pose2d_Log.vi	twist2d log(pose2d end)				
X	X		X	SI			Pose2d_Minus.vi	transform2d minus(pose2d other)				
X	X		X	SI			Pose2d_New_TRRO.vi	pose2d new(translation2d, rotation2d)				
X	X		X	SI			Pose2d_New.vi	pose2d new(double x, double y, rotation2d)				
X	X		X	SI			Pose2d_Plus.vi	pose2d plus(transform2d other)				
X	X		X	SI			Pose2d_RelativeTo.vi	pose2d relativeto(pose2d other)				
X	X		X	SI			Pose2d_TransformBy.vi	pose2d transformby(transform2d other)				
								pose2d 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
POSE3D	X	X		X	SI			Pose3d_Equals.VI					
	X	X		X	X			Pose3d_Exp.vi					
	X	X		X	SI			Pose3d_getRotation.vi					
	X	X		X	SI			Pose3d_getTranslation.vi					
	X	X	X	X	SI			Pose3d_getXYZ.vi					
	X	X		X	I			Pose3d_Interpolate.vi					
	X	X		X	X			Pose3d_Log.vi					
	X	X		X	SI			Pose3d_Minus.vi					
	X	X		X	SI			Pose3d_New.vi					
	X	X		X	SI			Pose3d_New_Default.vi					
	X	X			SI			Pose3d_New_Pose2d.vi					
	X	X		X	SI			Pose3d_New_Trans3dRot3d.vi					
	X	X		X	SI			Pose3d_Plus.vi					
	X	X		X	SI			Pose3d_RelativeTo.vi					
	X	X		No	SI			Pose3d_RotationVectorToMatrix.vi					
	X	X		X	SI			Pose3d_ToPose2d.vi					
	X	X		X	SI			Pose3d_TransformBy.vi					

	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	SI			Quaternion_Get_All.vi					
	X	X		X	SI			Quaternion_Get_LVQuat.vi					
	X	X		X	SI			Quaternion_Get_Vect.vi					
	X	X		X	SI			Quaternion_Get_W.vi					
	X	X		X	SI			Quaternion_Inverse.vi					
	X	X		X	SI			Quaternion_New.vi					
	X	X		X	SI			Quaternion_New_Default.vi					
	X	X		X	SI			Quaternion_New_LVQuat.vi					
	X	X		X	SI			Quaternion_Normalize.vi					
	X	X		X	SI			Quaternion_Plus.vi					
	X	X		X	SI			Quaternion_Times.vi					
	X	X		X	SI			Quaternion_ToRotationVector.vi					

FRC LabVIEW Trajectory Library – VI Implementation List

Revision 2.X   11/06/2022 – added various routines

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
ROTATION2D	X	X		X	SI			Rotation2d_CreateAngle.vi	rotation2d new(double value)				
	X	X		X	SI			Rotation2d_CreateAngleDegrees.vi	rotation2d fromDegrees(double degrees)	convert to radians then create			
	X	X		X	SI			Rotation2d_CreateAngleRotations.vi					
	X	X		X	SI			Rotation2d_CreateXY.vi	rotation2d new(double x, double y)				
	X	X		X	SI			Rotation2d_Equals.vi	boolean equals(rotation2d other)				
	X	X	X	X	SI			Rotation2d_GetAngleCosSin.vi		New 1/26/21			
	X	X		X	SI			Rotation2d_GetCos.VI	double getCos()	use cluster unpack			
	X	X		X	SI			Rotation2d_GetDegrees.VI	double getDegrees()	use cluster unpack, then convert to degree			
	X	X		X	SI			Rotation2d_GetRadians.VI	double getRadians()	use cluster unpack			
	X	X		X	SI			Rotation2d_GetRotations.vi					
	X	X		X	SI			Rotation2d_GetSin.VI	double getSin()	use cluster unpack			
	X	X		X	SI			Rotation2d_GetTan.VI	double getTan()	can calculate			
	X	X		X	SI			Rotation2d_Interpolate.vi					
	X	X		X	SI			Rotation2d_Minus.vi	rotation2d minus(rotation2d other)				
	X	X		X	SI			Rotation2d_Plus.vi	rotation2d plus(rotation2d other)				
	X	X		X	SI			Rotation2d_RotateBy.vi	rotation2d rotateby(rotation2d other)				
	X	X		X	SI			Rotation2d_Times.vi	rotation2d times(double scalar)				
	X	X		X	SI			Rotation2d_UnaryMinus.vi	rotation2d unaryminus( )				
									rotation2d 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
ROTATION3D	X	X		X	SI			Rotation3d_Create_AxisAngle.vi					
	X	X		X	SI			Rotation3d_Create_Default.vi					
	X	X		X	SI			Rotation3d_Create_Quaternion.vi					
	X	X		X	I			Rotation3d_Create_InitialFinalVector.vi					
	X	X		X	SI			Rotation3d_Create_RollPitchYaw.vi					
	X	X		X	I			Rotation3d_Create_RotMatrix.vi					
	X	X		X	SI			Rotation3d_Equals.vi					
	X	X	X	X	SI			Rotation3d_GetAxisAngle.vi					
	X	X		X	SI			Rotation3d_GetQuaternion.vi					
	X	X		X	SI			Rotation3d_GetXYZ.vi					
	X	X		X	SI			Rotation3d_Interpolate.vi					
	X	X		X	SI			Rotation3d_Minus.vi					
	X	X		X	SI			Rotation3d_Plus.vi					
	X	X		X	SI			Rotation3d_RotateBy.vi					
	X	X		X	SI			Rotation3d_Times.vi					
	X	X		X				Rotation3d_ToRotation2d.vi					
	X	X		X	SI			Rotation3d_UnaryMinus.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
TRANSFORM2D	X	X		X	SI			Transform2d_Create_PosePose.vi	transform2d new(pose2d, pose2d)				
	X	X		X	SI			Transform2d_Create_TransRot.vi	transform2d new(translation2d, rotation2d)				
	X	X		X	SI			Transform2d_Equals.VI	boolean equals(other transform2d)				
	X	X		X	SI			Transform2d_GetRotation.VI	rotation2d getRotation()	use cluster unpack			
	X	X		X	SI			Transform2d_GetTranslation.VI	translation2d getTranslation()	use cluster unpack			

Revision 2.X   11/06/2022 – added various routines

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			Transform2d_GetXY.vi					
X	X	X	X	SI			Transform2d_GetXYAngle.vi					
X	X		X	SI			Transform2d_Inverse.vi	transform inverse()	new			
X	X		X	Si			Transform2d_Plus.vi					
X	X		X	SI			Transform2d_Times.vi	transform2d times(double scalar)				
								transform2d new( )	can use cluster constant			

TRANSFORM3D

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			Transform3d_Create_Default.vi					
X	X		X	SI			Transform3d_Create_Pose3dPose.3dvi					
X	X		X	SI			Transform3d_Create_Trans3dRot3d.vi					
X	X		X	SI			Transform3d_Equals.VI					
X	X		X	SI			Transform3d_GetRotation3d.VI					
X	X		X	SI			Transform3d_GetTranslation3d.VI					
X	X	X	X	SI			Transform3d_GetXYZ.vi					
X	X		X	SI			Transform3d_Inverse.vi					
X	X		X	Si			Transform3d_Plus.vi					
X	X		X	SI			Transform3d_Times.vi					

TRANSLATION2D

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			Translation2d_Create_DistAng.vi					
X	X		X	SI			Translation2d_Create.vi	translation2d new(double x, double y)				
X	X		X	SI			Translation2d_Equals.vi	boolean equals(translation other)				
X	X		X	SI			Translation2d_GetAngle.vi					
X	X		X	SI			Translation2d_GetDistance.vi	double getDistance(translation2d other)				
X	X		X	SI			Translation2d_GetNorm.VI	double getNorm()	can use cluster unpack			
X	X		X	SI			Translation2d_GetX.VI	double getX()	can use cluster unpack			
X	X	X	X	SI			Translation2d_GetXY.VI					
X	X		X	SI			Translation2d_GetY.VI	double getY()	can use cluster unpack			
X	X		X	SI			Translation2d_Interpolate.vi					
X	X		X	SI			Translation2d_Minus.vi	translation2d minus(translation2d other)				
X	X		X	SI			Translation2d_Plus.vi	translation2d plus(translation2d other)				
X	X		X	SI			Translation2d_RotateBy.vi	translation2d rotateBy(rotation2d other)				
X	X		X	SI			Translation2d_Times.vi	translation2d times(double scalar)				
X	X		X	SI			Translation2d_UnaryMinus.vi	translation2d unaryminus( )				
								translation2d new()	can use cluster constant			
								translation2d div(double scalar)	can multiply by 1/scalar			

TRANSLATION3D

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			Translation3d_Create.vi					
X	X		X	SI			Translation3d_Create_Default.vi					
X	X		X	SI			Translation3d_Create_DistAng.vi					
X	X		X	SI			Translation3d_Div.vi					
X	X		X	SI			Translation3d_Equals.vi					
X	X		X	SI			Translation3d_GetDistance.vi					
X	X		X	SI			Translation3d_GetNorm.VI					
X	X	X	X	SI			Translation3d_GetXYZ.vi					

Revision 2.X   11/06/2022 – added various routines

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			Translation3d_Interpolate.vi					
X	X		X	SI			Translation3d_Minus.vi					
X	X		X	SI			Translation3d_Plus.vi					
X	X		X	SI			Translation3d_RotateBy.vi					
X	X		X	SI			Translation3d_Times.vi					
X	X		X	SI			Translation3d_ToTranslation2d.vi					
X	X		X	SI			Translation3d_UnaryMinus.vi					

TWIST2D

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			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					

TWIST3D

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	X		Twist3d_Create.vi					
X	X		X	SI	X		Twist3d_Equals.VI					
X	X	X	X	SI	X		Twist3d_GetAll.VI					

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

CHASSIS SPEEDS

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			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			

DIFFERENTIAL DRIVE KINEMATICS

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		X	DiffKinematics_New.vi	diffDriveKine new(double trackWidth)				
X	X		X	X		X	DiffKinematics_toChassisSpeed.vi	chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds)				
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

Revision 2.X 11/06/2022 – added various routines

DIFFERENTIAL DRIVE ODOMETRY

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

DIFFERENTIAL DRIVE WHEEL SPEEDS

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

MECANUM DRIVE KINEMATICS

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			MecaKinematics_New.vi					
X	X		X	X			MecaKinematics_SetInverseKinematics.vi					
X	X		X	X			MecaKinematics_ToChassisSpeeds.vi					
X	X		X	X			MecaKinematics_ToWheelSpeeds.vi					
X	X		X	X			MecaKinematics_ToWheelSpeedsZeroCenter.vi					

MECANUM DRIVE MOTOR VOLTAGE

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

nothing done

MECANUM DRIVE ODOMETRY

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
		X					MecaOdometry_Execute.vi					
X	X	X	X	X			MecaOdometry_GetKinematics.vi					
X	X		X				MecaOdometry_GetPose.vi					
X	X		X				MecaOdometry_New.vi					
X	X		X				MecaOdometry_NewDefaultPose.vi					
X	X		X				MecaOdometry_Reset.VI					
X	X		X				MecaOdometry_Update.vi					
X	X		X				MecaOdometry_UpdateWithTime.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 2.X   11/06/2022 – added various routines

MECANUM DRIVE WHEEL SPEEDS

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			MecaWheel_New.Vi	public MecanumDriveWheelSpeeds(double frontLeftMetersPerSecond, double frontRightMetersPerSecond, double rearLeftMetersPerSecond, double rearRightMetersPerSecond)				
X	X	X	X	SI			MecaWheel_GetAll.vi					
X	X		X	X			MecaWheel_Normalize.vi	public void normalize(double attainableMaxSpeedMetersPerSecond)				

SWERVE DRIVE KINEMATICS

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				SwerveKinematics_New4.VI		For 4 module drives			
X	X	X	X				SwerveKinematics_NewX.VI		uses array as input			
X	X	X	X				SwerveKinematics_NormalizeWheelSpeeds.vi	public static void normalizeWheelSpeeds(SwerveModuleState[] moduleStates, double attainableMaxSpeedMetersPerSecond)				
X	X	X	X				SwerveKinematics_ToChassisSpeeds4.VI		For 4 module drives			
X	X	X	X				SwerveKinematics_ToChassisSpeedsX.VI		uses array as input			
X	X		X				SwerveKinematics_ToSwerveModuleStates.VI	public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds, Translation2d centerOfRotationMeters)				
X	X		X				SwerveKinematics_ToSwerveModuleStatesZeroCenter.VI	public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds)				
								public SwerveDriveKinematics(Translation2d... wheelsMeters)	variable parameters (replace with array and "4" calls)			
								public ChassisSpeeds toChassisSpeeds(SwerveModuleState... wheelStates)	variable parameters (replace with array and "4" calls)			

SWERVE DRIVE ODOMETRY

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

SWERVE DRIVE MODULE STATE

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			SwerveModuleState_CompareTo.vi	public int compareTo(SwerveModuleState o)				
X	X		X	SI			SwerveModuleState_Get.vi					
X	X		X	SI			SwerveModuleState_New.vi	public SwerveModuleState(double speedMetersPerSecond, Rotation2d angle)				
X	X		X	SI			SwerveModuleState_Optimize.vi	public SwerveModuleState optimize(SwerveModuleState desired, Rotation2d angle)				

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Revision 2.X   11/06/2022 – added various routines

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				CubicHermiteSpline_getControlVectorFromArrays.vi	private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector)				
	X	X		X				CubicHermiteSpline_makeHermiteBasis.vi	private SimpleMatrix makeHermiteBasis()				
	X	X		X				CubicHermiteSpline_New.vi	public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector)				

	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)				
									public PoseWithCurvature()	can use cluster constant			
									public Pose2d poseMeters	not needed, use cluster unpack			
									public double curvatureRadPerMeter..	not needed, use cluster unpack			

	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				QuinticHermiteSpline_makeHermiteBasis.vi	private SimpleMatrix makeHermiteBasis()				
	X	X		X				QuinticHermiteSpline_New.vi	public QuinticHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector)				
									protected SimpleMatrix getCoefficients()	not needed, use cluster unpack			

	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)				
									Spline(int degree)				
									public static class ControlVector				
									public ControlVector(double[] x, double[] y)	implemented as data structure			

	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)				

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		SplineHelp_GetCubicCtrlVectorsFromWayPts.vi	public static Spline.ControlVector[] getCubicControlVectorsFromWaypoints(Pose2d start, Translation2d[] interiorWaypoints, Pose2d end)				
X	X	X	X				SplineHelp_GetCubicCtrlVectorsFromWeightedWayPts.vi					
X	X	X	No				SplineHelp_GetCubicSpline_Calc1.vi		internal			
X	X	X	No				SplineHelp_GetCubicSpline_Calc2.vi		internal			
X	X	X	No				SplineHelp_GetCubicSpline_Calc3.vi		internal			
X	X		X		X		SplineHelp_getCubicSplinesFromControlVectors.vi	public static CubicHermiteSpline[] getCubicSplinesFromControlVectors(Spline.ControlVector start, Translation2d[] waypoints, Spline.ControlVector end)				
X	X		X	SI			SplineHelp_GetQuinticCtrlVector.vi	private static Spline.ControlVector getQuinticControlVector(double scalar, Pose2d point)				
							SplineHelp_GetQuinticCtrlVectorsFromWayPts.vi	public static List<Spline.ControlVector> getQuinticControlVectorsFromWaypoints(List<Pose2d> waypoints)	REMOVED 2762			
							SplineHelp_GetQuinticCtrlVectorsFromWeightedWayPts.vi		REMOVED 2762			
X	X		X				SplineHelp_getQuinticSplinesFromControlVectors.vi	public static QuinticHermiteSpline[] getQuinticSplinesFromControlVectors(Spline.ControlVector[] controlVectors)				
X	X	X	X				SplineHelp_GetQuinticSplinesFromWeightedWayPts.vi		New 2762			
X	X		X				SplineHelp_GetQuinticSplinesFromWayPts.vi		New 2762			
X	X		No				SplineHelp_ThomasAlgorithm.vi	private static void thomasAlgorithm(double[] a, double[] b, double[] c, double[] d, double[] solutionVector)	internal			

	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		SplineParam_Spline.vi	public static List<PoseWithCurvature> parameterize(Spline spline)				
	X	X	X	No				SplineParam_StackGet.vi		internal			
	X	X	X	No				SplineParam_StackPop.vi		internal			
	X	X	X	No				SplineParam_StackPush.vi		internal			

'============
TRAJECTORY
'============

	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	(yellow)			Trajectory_Concatenate.vi					
	X	X		X				Trajectory_equals.vi	boolean equals(other obj)	FUTURE			
	X	X		X	SI			Trajectory_GetStates.vi	public List<State> getStates()	not needed, use unpack			
	X	X		X	SI			Trajectory_GetTotalTime.vi	public double getTotalTimeSeconds()	not needed, use unpack			
	X	X		No	SI			Trajectory_lerp_double.vi	private static double lerp(double startValue, double endValue, double t)	internal			
	X	X		No	SI			Trajectory_lerp_Pose.vi	private static Pose2d lerp(Pose2d startValue, Pose2d endValue, double t)	internal			
	X	X		X	SI			Trajectory_New_Empty.vi					
	X	X		X	SI			Trajectory_New.vi	public Trajectory(final List<State> states)				
	X	X		X	(yellow)			Trajectory_RelativeTo.vi	public Trajectory relativeTo(Pose2d pose)				
	X	X		X				Trajectory_Sample.vi	public State sample(double timeSeconds)				
	X	X	X	X	(yellow)			Trajectory_SampleReverse.vi		Sample in reverse order. Negate sample.			
	X	X		X	(yellow)			Trajectory_TransformBy.vi	public Trajectory transformBy(Transform2d transform)				
									public Pose2d getInitialPose()	can use cluster unpack, array index			

Revision 2.X   11/06/2022 – added various routines

TRAJECTORY_STATE

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			TrajectoryState_Equals.vi	boolean equals(other obj)				
X	X	X	X	SI			TrajectoryState_GetAll.vi					
X	X		X	SI			TrajectoryState_GetPose.vi					
X	X		X				TrajectoryState_Interpolate.vi	State interpolate(State endValue, double i)				
X	X		X	SI			TrajectoryState_New.vi	public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter)				
								public State()				

TRAJECTORY CONFIG

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				TrajectoryConfig_AddConstraint.vi	public TrajectoryConfig addConstraint(TrajectoryConstraint constraint)	Implemented differently, can't duplicate.			
X	X		X				TrajectoryConfig_AddConstraints.vi	public TrajectoryConfig addConstraints(List<? extends TrajectoryConstraint> constraints)	Implemented differently, can't duplicate.			
X	X		X	SI			TrajectoryConfig_Create.vi	public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq)				
X	X		X				TrajectoryConfig_GetCentripetalAccel.vi					
X	X	X	X				TrajectoryConfig_GetConstraints.vi	public List<TrajectoryConstraint> getConstraints()	Implemented differently, can't duplicate.			
X	X		X				TrajectoryConfig_GetEndVelocity.vi	public double getEndVelocity()	can use cluster unpack			
X	X		X				TrajectoryConfig_GetKinematicsDiffDrive.vi					
X	X		X				TrajectoryConfig_GetKinematicsMecanumfDrive.vi					
X	X		X				TrajectoryConfig_GetKinematicsSwerveDrive.vi					
X	X	X	X				TrajectoryConfig_GetMaxVelAccel.vi					
X	X		X				TrajectoryConfig_GetStartVelocity.vi	public double getStartVelocity()	can use cluster unpack			
X	X		X				TrajectoryConfig_GetVoltageDiffDrive.vi					
X	X		X				TrajectoryConfig_IsReversed.vi	public boolean isReversed()	can use cluster unpack			
X	X	X	X	SI			TrajectoryConfig_setCentripetalAccel.vi					
X	X		X				TrajectoryConfig_SetEndVelocity.vi	public TrajectoryConfig setEndVelocity(double endVelocityMetersPerSecond)				
X	X		X	SI			TrajectoryConfig_setKinematicsDiffDrive.vi	public TrajectoryConfig setKinematics(DifferentialDriveKinematics kinematics)				
X	X		X	SI			TrajectoryConfig_setKinematicsMecanumfDrive.vi	public TrajectoryConfig setKinematics(MecanumDriveKinematics kinematics)				
X	X		X	SI			TrajectoryConfig_setKinematicsSwerveDrive.vi	public TrajectoryConfig setKinematics(SwerveDriveKinematics kinematics)				
X	X		X	SI			TrajectoryConfig_setReversed.vi	public TrajectoryConfig setReversed(boolean reversed)				
X	X		X				TrajectoryConfig_SetStartVelocity.vi	public TrajectoryConfig setStartVelocity(double startVelocityMetersPerSecond)				
X	X	X	X	SI			TrajectoryConfig_setVoltageDiffDrive.vi					
								public double getMaxVelocity()	Created function to return both			
								public double getMaxAcceleration()	Created function to return both			

NOTE ADD OTHER "SET" ROUTINES FOR OTHER CONTRAINTS HERE, SINCE NEW CONTRAINTS ARE SPECIFIC AND NOT GENERIC.

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

Revision 2.X 11/06/2022 – added various routines

	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				TrajectoryGenerate_Make_Cubic.vi	public static Trajectory generateTrajectory(Pose2d start, List<Translation2d> interiorWaypoints, Pose2d end, TrajectoryConfig config)	uses cubic splines			
	X	X	X	X				TrajectoryGenerate_Make_Generic.vi	Helper to bring these all together….	Use this one!!!			
	X	X		X				TrajectoryGenerate_Make_Quintic_CtrlVect.vi	public static Trajectory generateTrajectory(ControlVectorList controlVectors, TrajectoryConfig config)	uses quintic splines			
	X	X	X	X				TrajectoryGenerate_Make_Quintic_Weighted.vi		New 2762			
	X	X		X				TrajectoryGenerate_Make_Quintic.vi	public static Trajectory generateTrajectory(List<Pose2d> waypoints, TrajectoryConfig config)	uses quintic splines			
	X	X		X				TrajectoryGenerate_splinePointsFromSplines.vi	public static List<PoseWithCurvature> splinePointsFromSplines(Spline[] splines)				

	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			
									public ControlVectorList()	may not need, just data			
									public ControlVectorList(Collection<? extends Spline.ControlVector> collection)	may not need, just data			

	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	No				TrajectoryParam_calcStuffRev.vi					
	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	No				TrajectoryParam_enforceVelocity.vi		This routines needs to be changed when new constraints are added.			
	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)				

	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				ConstrainedState_SetMaxAccel.vi					
	X	X	X	X				ConstrainedState_SetMinAccel.vi					
	X	X	X	X				ConstrainedState_SetVelAccel.vi					
	X	X	X	X				ConstrainedState_SetVelocity.vi					
									ConstrainedState()				

Revision 2.X   11/06/2022 – added various routines

	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			TrajectoryUtil_MakeWeightedWayPoint_ENG.vi					
	X	X	X	X	X			TrajectoryUtil_MakeWeightedWayPoint.vi					
	X	X		X				TrajectoryUtil_toPathWeaverJSON.vi	public static void toPathweaverJson(Trajectory trajectory, Path path)				
									public static Trajectory deserializeTrajectory(String json)				
									public static String serializeTrajectory(Trajectory trajectory)				

	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				TrapProfile_Calculate.vi		
	X	X		No				TrapProfile_Direct.vi		Private, remove from menu
	X	X	X	X				TrapProfile_Execute.vi		
	X	X	X	X	SI			TrapProfile_Execute_AtGoal.vi		
	X	X		X				TrapProfile_IsFinished.vi		
	X	X		X				TrapProfile_New_DefInitial.vi		
	X	X		X				TrapProfile_New.vi		
	X	X		No				TrapProfile_ShouldFlipAcceleration.vi		Private, remove from menu
	X	X		X				TrapProfile_TimeLeftUntil.vi		
	X	X		X				TrapProfile_TotalTime.vi		
	X	X		X				TrapProfState_Equals.vi		
	X	X		X				TrapProfState_New.vi		

'===========
TRAJECTORY CONSTRAINT
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	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				CentripetalAccelConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X	SI			CentripetalAccelConstraint_New.vi	public CentripetalAccelerationConstraint(double maxCentripetalAccelerationMetersPerSecondSq)	Can use cluster pack for now

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
DIFF DRIVE KINEMATIC CONSTRAINT	X	X		X				DiffDriveKinematicsConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	

Revision 2.X   11/06/2022 – added various routines

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

MECANUM DRIVE KINEMATICS CONSTRAINT

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

RECTANGULAR REGION CONSTRAINT

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

SWERVE DRIVE KINEMATICS CONSTRAINT

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

TRAJECTORY CONSTRAINT

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

TRAJECTORY CONSTRAINT (Min Max)

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

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UTILITY

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THESE ROUTINES ARE SPECIFIC TO LABVIEW. THEY DO NOT HAVE A

Revision 2.X   11/06/2022 – added various routines
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	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		

Revision 2.X   11/06/2022 – added various routines

	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
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	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_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_GetVex775Pro.vi					
	X	X		X	SI			DCMotor_New.vi					

Revision 2.X   11/06/2022 – added various routines

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			DCMotor_PickMotor.vi					

LINEAR SYSTEM ID

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				LinearSystemId_CreateDCMotorSystem.vi					
X	X		X				LinearSystemId_CreateDriveTrainVelocitySystem.vi		Update to use create matrix			
X	X		X				LinearSystemId_CreateElevatorSystem.vi		Update to use create matrix			
X	X		X				LinearSystemId_CreateFlywheelSystem.vi		Update to use create matrix			
X	X		X				LinearSystemId_CreateSingleJointedArmSystem.vi		Update to use create matrix			
X	X		X				LinearSystemId_IdentifyDriveTrainSystem.vi		Update to use create matrix			
X	X		X				LinearSystemId_IdentifyPositionSystem.vi		Update to use create matrix			
X	X		X				LinearSystemId_IdentifyVelocitySystem.vi		Update to use create matrix			

'===========
STATE SPACE ESTIMATION
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DIFFERENTIAL DRIVE POSE ESTIMATOR

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				DiffDrivePoseEst_AddVisionMeasurement.vi					
X	X		X				DiffDrivePoseEst_FillStateVector.vi					
X	X		X				DiffDrivePoseEst_GetEstimatedPosition.vi					
X	X		X				DiffDrivePoseEst_Kalman_F_Callback.vi					
X	X		X				DiffDrivePoseEst_Kalman_H_Callback.vi					
X	X		X				DiffDrivePoseEst_New.vi					
X	X		X				DiffDrivePoseEst_ResetPosition.vi					
X	X		X				DiffDrivePoseEst_SetVisionMeasurementStdDevs.vi					
X	X		X				DiffDrivePoseEst_Update.vi					
X	X		X				DiffDrivePoseEst_UpdateWithTime.vi					
X	X		X				DiffDrivePoseEst_VisionCorrect_Callback.vi					
X	X		X				DiffDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi					

EXTENDED KALMAN FILTER

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				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					

Revision 2.X   11/06/2022 – added various routines

KALMAN FILTER

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		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					

KALMAN FILTER LATENCY COMPENSATOR

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	🟨			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					

MECANUM DRIVE POSE ESTIMATOR

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
🟨							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	🟨			MecaDrivePoseEst_UpdateWithTime.vi					
X	X		No	🟨			MecaDrivePoseEst_VisionCorrect_Callback.vi					
X	X		No	🟨			MecaDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi					

SWERVE DRIVE POSE ESTIMATOR

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

Revision 2.X   11/06/2022 – added various routines

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				SwerveDrivePoseEst_AddVisionMeasurement.vi					
X	X		X				SwerveDrivePoseEst_GetEstimatedPosition.vi					
X	X		X				SwerveDrivePoseEst_Kalman_F_Callback.vi					
X	X		X				SwerveDrivePoseEst_Kalman_H_Callback.vi					
X	X		X				SwerveDrivePoseEst_New.vi					
X	X		X				SwerveDrivePoseEst_ResetPosition.vi					
X	X		X				SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi					
X	X		X				SwerveDrivePoseEst_Update.vi					
X	X		X				SwerveDrivePoseEst_UpdateWithTime.vi					
X	X		X				SwerveDrivePoseEst_VisionCorrect_Callback.vi					
X	X		X				SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi					

UNSCENTED KALMAN FILTER

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				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
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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

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		DiffDrvAccelLimit_Calculate.vi					
X	X		X		X		DiffDrvAccelLimit_New.vi					

Revision 2.X   11/06/2022 – added various routines

IMPLICIT MODEL FOLLOWER

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		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					

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

Revision 2.X   11/06/2022 – added various routines

	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	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				LinearSystemLoop_Correct.vi					
								LinearSystemLoop_GetClampFunction.vi					
	X	X		X				LinearSystemLoop_GetController.vi					
	X	X		X				LinearSystemLoop_GetError_Single.vi					
	X	X		X				LinearSystemLoop_GetError.vi					
	X	X		X				LinearSystemLoop_GetFeedForward.vi					
	X	X		X				LinearSystemLoop_GetNextR_Single.vi					
	X	X		X				LinearSystemLoop_GetNextR.vi					
	X	X		X				LinearSystemLoop_GetObserver.vi					
	X	X		X				LinearSystemLoop_GetU_Row.vi					
	X	X		X				LinearSystemLoop_GetU.vi					
	X	X		X				LinearSystemLoop_GetXHat_Single.vi					
	X	X		X				LinearSystemLoop_GetXHat.vi					
								LinearSystemLoop_New_BBB					
								LinearSystemLoop_New_LinearSystem_ClampFunc					
	X	X		X				LinearSystemLoop_New_LinearSystem_ClampVal.vi					
	X	X		X				LinearSystemLoop_New.vi					
	X	X		X				LinearSystemLoop_Predict.vi					
	X	X		X				LinearSystemLoop_Reset.vi					
								LinearSystemLoop_SetClampFunction.vi					
								LinearSystemLoop_SetNextR_Some.vi					
	X	X		X				LinearSystemLoop_SetNextR.vi					
								LinearSystemLoop_SetXHat_Single.vi					
								LinearSystemLoop_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
LTV DIFFERENTIAL DRIVE CONTROLLER	X	X		X				LTVDiffDriveCtrl_Calculate.vi					
	X	X		X				LTVDiffDriveCtrl_New.vi					
	X	X		X				LTVDiffDriveCtrl_Calculate_TrajState.vi					
	X	X		X				LTVDiffDriveCtrl_Calculate_SetTolerance.vi					
	X	X		X				LTVDiffDriveCtrl_Calculate_AtReference.vi					

LTV UNICYCLE CONTROLLER

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		LTVUnicycleCtrl_AtReference.vi					
X	X		X		X		LTVUnicycleCtrl_Calculate_TrajState.vi					
X	X		X		X		LTVUnicycleCtrl_Calculate.vi					
X	X		X		X		LTVUnicycleCtrl_New.vi					
X	X		X		X		LTVUnicycleCtrl_SetEnabled.vi					
X	X		X		X		LTVUnicycleCtrl_SetTolerance.vi					

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

CALLBACK 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				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					

DISCRETIZATION

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		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					

STATE SPACE UTIL

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	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					

Revision 2.X   11/06/2022 – added various routines

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

BATTERY SIM

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			BatterySim_CalculateDefaultBatteryLoadedVoltage.vi					
X	X		X	SI			BatterySim_CalculateLoadedVoltage.vi					

DC MOTOR SIM

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				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_SetInputVoltage.vi					
X	X		X				DCMotorSim_Update.vi					

DIFFERENTIAL DRIVE TRAIN SIM

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				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_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_SetCurrentGearing.vi					
X	X		X				DiffDriveTrainSim_SetInputs.vi					
X	X		X				DiffDriveTrainSim_SetPose.vi					
X	X		X				DiffDriveTrainSim_SetState.vi					
X	X		X				DiffDriveTrainSim_ToughBoxMiniGearRatio.vi					

Revision 2.X   11/06/2022 – added various routines

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				DiffDriveTrainSim_ToughBoxMiniMotor.vi					
X	X		X				DiffDriveTrainSim_Update.vi					

ELEVATOR SIM

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				ElevatorSim_GetCurrentDraw.vi					
X	X		X				ElevatorSim_GetPositionMeters.vi					
X	X		X				ElevatorSim_GetVelocityMetersPerSecond.vi					
X	X		X				ElevatorSim_HasHitLowerLimit.vi					
X	X		X				ElevatorSim_HasHitUpperLimit.vi					
							ElevatorSim_New_LinSys_NoNoise.vi					
							ElevatorSim_New_LinSys.vi					
							ElevatorSim_New_NoNoise.vi					
X	X		X				ElevatorSim_New.vi					
X	X	X	No				ElevatorSim_RKF45_Func.vi					
X	X		X				ElevatorSim_SetInputVoltage.vi					
X	X		X				ElevatorSim_SetState.vi					
X	X	X	X				ElevatorSim_Update.vi		Needed because this doesn't extend.			
X	X		X				ElevatorSim_UpdateX.vi					
X	X		X				ElevatorSim_WouldHitLowerLimit.vi					
X	X		X				ElevatorSim_WouldHitUpperLimit.vi					

FLYWHEEL SIM

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				FlyWheelSim_GetAngularVelocityRadPerSec.vi					
X	X		X				FlyWheelSim_GetAngularVelocityRPM.vi					
X	X		X				FlyWheelSim_GetCurrentDrawAmps					
							FlyWheelSim_New_LinSys		Future			
							FlyWheelSim_New_LinSys_MOI_NoNoise		Future			
							FlyWheelSim_New_LinSys_NoNoise		Future			
X	X		X				FlyWheelSim_New_MOI.vi					
X	X		X				FlyWheelSim_SetInput.vi					
X	X		X				FlyWheelSim_SetState.vi					
X	X		X				FlyWheelSim_Update.vi					

LINEAR SYSTEM SIM

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_ClampInput.vi					
							LinearSystemSim_GetCurrentDrawAmps.vi		DONT IMPLEMENT…			
X	X		X				LinearSystemSim_GetOutput_Single.vi					
X	X		X				LinearSystemSim_GetOutput.vi					
X	X		X				LinearSystemSim_New					
							LinearSystemSim_New_NoNoise.vi					
X	X		X				LinearSystemSim_SetInput_Array.vi		Doesn't use clamp ?			
X	X		X				LinearSystemSim_SetInput_Single.vi					
X	X		X				LinearSystemSim_SetInput.vi					
X	X		X				LinearSystemSim_Setstate.vi					
X	X		X				LinearSystemSim_Update.vi					

Revision 2.X   11/06/2022 – added various routines

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			No			LinearSystemSim_UpdateX.vi					
X	X	X		No			LinearSystemSim_UpdateY.vi					

SINGLE JOINT ARM SIM

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				SngJntArmSim_EsitmateMOI.vi					
X	X		X				SngJntArmSim_GetAngleRads.vi					
X	X		X				SngJntArmSim_GetCurrentDraw.vi					
X	X		X				SngJntArmSim_GetVelocityRadsPerSec.vi					
X	X		X				SngJntArmSim_HasHitLowerLimit.vi					
X	X		X				SngJntArmSim_HasHitUpperLimit.vi					
X	X		X				SngJntArmSim_New.vi					
X	X		No				SngJntArmSim_Rkf45_Func.vi					
X	X		X				SngJntArmSim_SetInputVoltage.vi					
X	X		X				SngJntArmSim_SetState.vi					
X	X		X				SngJntArmSim_Update.vi					
X	X		X				SngJntArmSim_UpdateX.vi					
X	X		X				SngJntArmSim_WouldHitLowerLimit.vi					
X	X		X				SngJntArmSim_WouldHitUpperLimit.vi					

'============
MATRIX UTILITIES
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MAT 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			MatBuilder_Create.vi					
X	X		X	SI			MatBuilder_Fill.vi					

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			Matrix_AssignBlock.vi					
X	X		X	SI			Matrix_Block.vi					
							Matrix_ChangeBoundsUnchecked.vi					
X	X		X	SI			Matrix_Create.vi					
							Matrix_Det.vi					
X	X		X	SI			Matrix_Diag.vi					
							Matrix_Div_Scalar.vi		labview has function			
							Matrix_ElementPower.vi					
X	X		X	SI			Matrix_ElementSum.vi					
							Matrix_ElementTimes.vi					
							Matrix_Equals.vi					
X	X		X	I			Matrix_Exp.vi					
X	X		X	SI			Matrix_ExtractColumnVector.vi					
X	X		X	SI			Matrix_ExtractFrom.vi					
							Matrix_ExtractMatrix.vi					
X	X		X	SI			Matrix_ExtractRowVector.vi					
X	X		X	SI			Matrix_Fill.vi					
							Matrix_Get.vi		labview has function			

Revision 2.X   11/06/2022 – added various routines

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

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

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

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

VECTOR

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			Vector_Dot.vi					
X	X		X	Si			Vector_Norm.vi					

'===========
MATH
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ANGLE STATISTICS

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	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					

MATH UTILITY

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			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					

MERWE SCALED SIGMA POINTS

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			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					

Revision 2.X   11/06/2022 – added various routines

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			MerweScSigPts_New.vi					
X	X		X	I			MerweScSigPts_SigmaPoints.vi					

NUMERICAL INTEGRATION

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			NumIntegrate_Func_Ax_Bu_K.vi		NOT USED. Should this be used or abandoned???			
X	X		X	(yellow)			NumIntegrate_Rk4_Dbl_X_U.vi					
X	X		X	(yellow)			NumIntegrate_Rk4_Dbl_X.vi					
X	X		X	(yellow)			NumIntegrate_Rk4_Mat_X_U.vi					
X	X		X	(yellow)			NumIntegrate_Rk4_Mat_X.vi					
X	X		No	SI			NumIntegrate_Rkdp_Func_A.vi					
X	X		No	SI			NumIntegrate_Rkdp_Func_B1.vi					
X	X		No	SI			NumIntegrate_Rkdp_Func_B1B2.vi					
X	X		No	SI			NumIntegrate_Rkdp_Func_B2.vi					
X	X		No	I			Numintegrate_Rkdp_Impl.vi					
X	X		X	(yellow)			NumIntegrate_RKDP_Mat_X_U.vi		New replacement for RKF45			
X	X		No	SI			NumIntegrate_Rkf45_Func_A.vi					
X	X		No	SI			NumIntegrate_Rkf45_Func_B1.vi					
X	X		No	SI			NumIntegrate_Rkf45_Func_B1B2.vi					
X	X		No	SI			NumIntegrate_Rkf45_Func_B2.vi					
(grey)	(grey)		(grey)	(grey)			NumIntegrate_RKf45_Func_Bs.vi		Removed. Replaced with newer functions.			
(grey)	(grey)		(grey)	(grey)			NumIntegrate_RKf45_Func_Ch.vi		Removed. Replaced with newer functions.			
(grey)	(grey)		(grey)	(grey)			NumIntegrate_RKf45_Func_Ct.vi		Removed. Replaced with newer functions.			
X	X		No	I			NumIntegrate_Rkf45_Impl.vi					
X	X		X	(yellow)			NumIntegrate_Rkf45_Mat_X_U.vi		Note that this Feinberg method has been changed and a Dormand Price method has been implemented…. TODO			
(grey)	(grey)		(grey)	(grey)			NumIntegrate_RKf45_New.vi		Removed. Never used.			
X	X	X	X	SI			NumIntegrate_Trap_Dbl.vi					
X	X	X	X	I			NumIntegrate_Trap_Mat.vi					

RUNGE KUTTA TIME VARYING

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		No	(yellow)			RungeKuttaTimeVarying_RK4_Mat_T_Y.vi					

NUMERICAL JACOBIAN

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	(yellow)			NumJacobian_U.vi					
X	X		X	(yellow)			NumJacobian_X.vi					

RICCATI

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				Riccati_Check_Detectable.vi		Routine exists, it is just a shell			
X	X		X				Riccati_Check_Stabilizable.vi		Not really done !!!			
							Riccati_DARE_Choose.vi		Intended to allow DARE method testing.			
X	X	X	X		X		Riccati_DARE_Iterate.vi					
X	X	X	X		X		Riccati_DARE_StructDoubling.vi					
X	X		X				Riccati_DARE_N.vi					
X	X		X		X		Riccati_DARE.vi					
X	X		X				Riccati_Input_Check.vi					

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

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

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
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_TYPES_ENUM.CTL					
Z	Z	X	X	N/A			DCMOTOR.CTL					
Z	Z	X	X	N/A			DCMOTOR_SIM.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_Pose_EST.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	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	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	X	N/A		FUNCTION_GENERATOR.ctl		
Z	Z	X	X	N/A		FUNCTION_GENERATOR_MATRIX.ctl		
Z	Z	X	X	N/A		HOLONOMIC_DRV_CTRL.CTL		New 1/26/21
Z	Z	X	X	N/A		TIME_INTERPOLATABLE_BOOLEAN.CTL		
Z	Z	X	X	N/A		TIME_INTERPOLATABLE_DOUBLE.CTL		
Z	Z	X	X	N/A		TIME_INTERPOLATABLE_POSE2D.CTL		
Z	Z	X	X	N/A		TIME_INTERPOLATABLE_ROTATION2D.CTL		
Z	Z	X	X	N/A		KALMAN_FILTER_LATENCY_COMP_FUNC_GROUP.CTL		
Z	Z	X	X	N/A		KALMAN_FILTER_LATENCY_COMP.CTL		
Z	Z	X	X	N/A		KALMAN_FILTER.ctl		
Z	Z	X	X	N/A		LINEAR_FILTER.CTL		
Z	Z	X	X	N/A		LINEAR_PLANT_INV_FF.ctl		
Z	Z	X	X	N/A		LINEAR_QUADRATIC_REGULATOR.ctl		
Z	Z	X	X	N/A		LINEAR_SYSTEM_LOOP.ctl		
Z	Z	X	X	N/A		LINEAR_SYSTEM_SIM.ctl		
Z	Z	X	X	N/A		LINEAR_SYSTEM.ctl		
Z	Z	X	X	N/A		LTV_DIFF_DRIVE_CTRL.ctl		
Z	Z	X	X	N/A		LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl		
Z	Z	X	X	N/A		LTV_UNICYCLE_CONTROLLER.CTL		
N/A		N/A		N/A		LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl		OBSOLETE – Removed
Z	Z	X	X	N/A		LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl		
Z	Z	X	X	N/A		MECA_DRIVE_KINEMATICS.CTL		
Z	Z	X	X	N/A		MECA_DRIVE_ODOMETRY.CTL		
Z	Z	X	X	N/A		MECA_DRIVE_POSE_EST.CTL		
Z	Z	X	X	N/A		MECA_WHEEL_SPEEDS.CTL		
Z	Z	X	X	N/A		MEDIAN_FILTER.CTL		
Z	Z	X	X	N/A		MERWE_SCALED_SIGMA_PTS.ctl		
Z	Z	X	X	N/A		OBSERVER_SNAP_LIST_ITEM.CTL		
Z	Z	X	X	N/A		OBSERVER_SNAPSHOT.CTL		
Z	Z	X	X	N/A		PARAM_STACK_ITEM.CTL		
Z	Z	X	X	N/A		PARAM_STACK.CTL		
Z	Z	X	X	N/A		PID_ADV_LIMITS.CTL		
Z	Z	X	X	N/A		PID_ADV_TUNING.CTL		
Z	Z	X	X	N/A		PID_CONTROLLER.CTL		
Z	Z	X	X	N/A		PID_ERROR_TOLERANCE.CTL		
Z	Z	X	X	N/A		PID_INPUT_LIMITS.CTL		
Z	Z	X	X	N/A		PID_TUNING.CTL		
Z	Z	X	X	N/A		POSE2D.CTL		
Z	Z	X	X	N/A		POSE3D.CTL		
Z	Z	X	X	N/A		POSEwCURVATURE.CTL		
Z	Z	X	X	N/A		PROFILED_PID_CONTROLLER.CTL		
Z	Z	X	X	N/A		QUATERNION.CTL		
Z	Z	X	X	N/A		RAMSETE_EXE_TUNING.CTL		
Z	Z	X	X	N/A		RAMSETE.CTL		
Z	Z	X	X	N/A		ROTATION2D.CTL		
Z	Z	X	X	N/A		ROTATION3D.CTL		
Z	Z	X	X	N/A		SIMPLE_MOTOR_FF.CTL		
Z	Z	X	X	N/A		SINGLE_JOINT_ARM_SIM.CTL		
Z	Z	X	X	N/A		SLEW_RATE_LIMITER.CTL		
Z	Z	X	X	N/A		SPLINE_CTRL_VECTOR.CTL		
Z	Z	X	X	N/A		SPLINE.CTL		
Z	Z	X	X	N/A		SWERVE_DRIVE_KINEMATICS.CTL		
Z	Z	X	X	N/A		SWERVE_DRIVE_MODULE_STATE.CTL		
Z	Z	X	X	N/A		SWERVE_DRIVE_ODOMETRY.CTL		
Z	Z	X	X	N/A		SWERVE_DRIVE_Pose_EST.CTL		
Z	Z	X	X	N/A		TIMER.CTL		
Z	Z	X	X	N/A		TRAJ_CONFIG.CTL		

Revision 2.X   11/06/2022 – added various routines

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