Revision 3.X 1/11/2023 – renamed library. Added additional documentation.

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...

VI / CTL Totals
VI Total (X)
CTL Totals
VI Total (Z)
VI Shell Total (I)
CTRL Shell Total (I)

Doc completed Pct 99.37% Optimization Pct 57.04%

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

'===== BASE

'========

ANALOG DELAY	X Implemented	X Documented	X Not WPILIB	X Menu Item	- Execution Optimized	Test Routine		VI Name AnalogDelay_Execute.vi	Function Prototype	Notes Similar to interpolated tree map	Code Review	Test Program	Error Checking
BUMPLESS TRANSFER	X Implemented	X Documented	X Not WPILIB	X Menu Item	- Execution Optimized	Test Routine		VI Name BumplessTransfer Execute.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
FUNCTION GENERATOR	X X X	X X X		X X X				FunctionGenerator_Add_Value.vi FunctionGenerator_Add_XY.vi FunctionGenerator_Calculate.vi		Similar to interpolated tree map Similar to interpolated tree map Similar to interpolated tree map			
	X	X	X	X	SI I			FunctionGenerator_Clear.vi FunctionGenerator_Execute.vi		Similar to interpolated tree map			
	Χ	Χ		X	SI			FunctionGenerator_New.vi		Similar to interpolated tree map			
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine			Function Prototype	Notes	Code Review	Test Program	Error Checking
FUNCTION GENERATOR MATRIX	X	X	X	X	1			FunctionGeneratorMatrix_Add.vi		Similar to interpolated tree map			

FRC_LabVIEW_Trajectory_Library_Routines.xlsx

X

X

X X

X

X XX X

Χ

Χ

X SI

WPILib LabVIEW Math Library – VI Implementation List Revision 3.X 1/11/2023 – renamed library. Added additional documentation. Similar to interpolated tree map.. FunctionGeneratorMatrix New.vi X X X X SI VI Name Function Prototype Notes LEAD LAG X X X X LeadLag Execute.vi Function Prototype Notes LINEAR FILTER X X XI LinearFilter BackwardFiniteDifference.vi XX X SI LinearFilter Calculate.vi LinearFilter CutoffFrequency.vi X X X X X X LinearFilter Execute.vi X X X X I Labview style helper AN INTERNAL ROUTINE XX LinearFilter Factorial.vi No I X LinearFilter FiniteDifference.vi Χ Χ XX LinearFilter HighPass.vi X X X X X X LinearFilter HighPassBW1.vi LinearFilter HighPassBW2.vi X X X LinearFilter LowPassBW1.vi X X X XLinearFilter LowPassBW2.vi XX X LinearFilter_MovingAverage.vi XX X LinearFilter New.vi LinearFilter Reset.vi XX X SI LinearFilter ResetToValue.vi X X X X SI LinearFilter SinglePoleIIR.vi XX XX X X X X LinearFilter_TimeConst.vi VI Name Function Prototype Notes MEDIAN FILTER X MedianFilter Calculate.vi Χ X X X X MedianFilter Execute.vi Labview style helper Χ X SI X SI X Χ MedianFilter New.vi MedianFilter Reset.vi X X X X SI MedianFilter ResetToValue.vi Function Prototype Notes SLEW RATE FILTER X X Χ SlewRateLimiter Calculate.vi X X X X SI SlewRateLimiter Close.vi X X X X I X SlewRateLimiter Execute.vi Labview style helper SlewRateLimiter GetRate.vi XX X X SI

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SlewRateLimiter New.vi

SlewRateLimiter Reset.vi

SlewRateLimiter SetRate.vi

SlewRateLimiter_NewInitialZero.vi

WPILib LabVIEW Math Library – VI Implementation List Revision 3.X 1/11/2023 – renamed library. Added additional documentation. Execution Optimized Routine Not Function Prototype Notes TIMER X X Timer Close.vi releases semaphore Χ Timer Get.vi X X X X X Timer GetAndReset.vi X X X No Timer GetInternal.vi Internal (private) only XX X X Timer HasPeriodPassed.vi $X \mid X \mid X \mid X$ X Timer HasPeriodPassedOnce.vi X Timer_New.vi XX X Χ X X Timer Reset.vi X Χ X X No Timer ResetInternal Internal (private) only X Timer Start.vi X X X Χ X X Timer Stop.vi X X X No Timer_StopInternal.vi Internal (private) only Function Prototype VI Name Notes TIME INTERPOLATABLE BOOLEAN X X TimeInterpBoolean_AddSample.vi XX 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 TimeInterpBoolean GetSample.vi $X \mid X \mid X \mid X \mid I$ TimeInterpBoolean GetTimeForValue.vi X X X X SI TimeInterpBoolean New.vi X X X X SI TimeInterpBoolean SetMaxTime.vi Optimized VI Name Function Prototype Notes TIME INTERPOLATABLE DOUBLE X X X X TimeInterpDouble AddSample.vi Update to use create matrix Χ X No TimeInterpDouble_CleanUp.vi Update to use create matrix TimeInterpDouble Clear.vi Χ X X SI X X X I TimeInterpDouble GetSample.vi X X X TimeInterpDouble_GetTimeForValue.vi X X X X SI TimeInterpDouble New.vi TimeInterpDouble SetMaxTime.vi X X X X SI Function Prototype Notes TIME INTERPOLATABLE POSE2D X X X X TimeInterpPose2d AddSample.vi Update to use create matrix TimeInterpPose2d CleanUp.vi X X X No I Update to use create matrix X X X SI TimeInterpPose2d Clear.vi X X X X I TimeInterpPose2d GetSample.vi TimeInterpPose2d GetTimeForValue.vi X X X X SI X X X X X SI TimeInterpPose2d New.vi

TimeInterpPose2d SetMaxTime.vi

Revision 3.X 1/11/2023 – renamed library. Added additional documentation. Function Prototype X X X X I X X X No I X X X X SI TimeInterpRotation2d AddSample.vi TIME INTERPOLATABLE ROTATION2D Update to use create matrix TimeInterpRotation2d_CleanUp.vi Update to use create matrix TimeInterpRotation2d Clear.vi X X X X I TimeInterpRotation2d_GetSample.vi TimeInterpRotation2d GetTimeForValue.vi X X X X SI TimeInterpRotation2d New vi TimeInterpRotation2d_SetMaxTime.vi X X X X SI Function Prototype VI Name Notes WAIT ADJUST X WaitAdjust.vi Function Prototype Notes DIGITAL SEQUENTIAL LOGIC X X DigSeqLogic_Delay.vi X X Χ X X X DigSeqLogic_On_Delay.vi Χ X X X DigSeqLogic_Off_Delay.vi X X X X X X DigSeqLogic_One_Shot.vi DigSeqLogic_SR_Flip_Flop.vi Function Prototype VI Name Notes DEBOUNCER X Debouncer New.vi X X Χ Debouncer Calculate.vi XX XX Debouncer Execute.vi XX No Debouncer Reset.vi XX No Debouncer HasElapsed.vi '======== CONTROLLER '======= Function Prototype Notes ArmFF Calculate.vi ARM FF X X X X ArmFF CalculateVelocityOnly.vi XX

WPILib LabVIEW Math Library – VI Implementation										
Revision 3.X 1/11/2023 – renamed library. Added additiona	al documenta	ation.			ArmFF_Execute.vi		LabVIEW style single call			
		X			ArmFF_ExecuteVelocityOnly.vi		LabVIEW style single call			
		X	X		ArmFF_MaxAchieveAccel.vi		, ,			
	X	X	X		ArmFF_MaxAchieveVelocity.vi					
		X	X		ArmFF_MinAchieveAccel.vi					
	X	X	X		ArmFF_MinAchieveVelocity.vi					
	X	X X	X		ArmFF_New_ZeroGravity.vi ArmFF_New.vi					
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	mplemente	Documente Not WPILIB	Menu Item	Execution Op Test Routine	Sample of the state of the stat			de Revie	st Progra	ર્ડ
			We		⊗ VI Name	Function Prototype	Notes	Code	Test	Error
BANG BA		X		SI	BangBang_AtSetpoint.vi					
	X	X		SI	BangBang_Calculate_PV.vi					
	X	X X X	X	SI	BangBang_Calculate_SP_PV.vi					
		$\begin{array}{c c} X & X \\ \hline X & \end{array}$		SI SI	BangBang_Execute.vi BangBang_GetAll.vi					
		X		SI	BangBang_GetError.vi					
		X		SI	BangBang_New.vi					
		X		SI	BangBang_SetSetpoint.vi					
	X	X		SI	BangBang SetTolerance.vi					
CONTROLLER U		X Documented Not WPILIB		© Execution Op	ชื่อ อีเมื่อ ซึ่ง VI Name ControllerUtil_GetModulusError.vi	Function Prototype	Notes This was short lived in WPILIB, but still useful here.	Code Review	Test Program	Error Checking
	Implemented	Documented Not WPILIB	Menu Item	Execution Optimized Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
ELE\	/ FF X	X	X		ElevFF_Calculate.vi					
	X	X	X		ElevFF_CalculateVelocityOnly.vi		1110514			
		X			ElevFF_Execute.vi		LabVIEW style single call			
	X	X	X		ElevFF_ExecuteVelocityOnly.vi ElevFF MaxAchieveAccel.vi		LabVIEW style single call			
		X	X		ElevFF_MaxAchieveAccel.vi ElevFF_MaxAchieveVelocity.vi					
		X	X		ElevFF MinAchieveAccel.vi					
	1		1 - 1	1		1				
	X	X	X		ElevFF MinAchieveVelocity.vi					
		X X	X		ElevFF_MinAchieveVelocity.vi					
	X	X X X	X X X		ElevFF_MinAchieveVelocity.vi ElevFF_New_ZeroAccel.vi ElevFF_New.vi					
	XXX	X X	X X	cution Optimized	ElevFF_MinAchieveVelocity.vi ElevFF_New_ZeroAccel.vi			le Review	t Program	S
	XXX	X X	X X	Execution Optimized	ElevFF_MinAchieveVelocity.vi ElevFF_New_ZeroAccel.vi ElevFF_New.vi	Function Prototyne	Notes	code Review	est Program	ઇ
HOL DRV C	X X X X X X X X X X	Documented X X Not WPILIB	Menu Item X X	Execution Optimized Test Routine	ElevFF_MinAchieveVelocity.vi ElevFF_New_ZeroAccel.vi ElevFF_New.vi	Function Prototype	Notes Added 1/24/2022	Code Review	Test Program	Error Checking
HOL_DRV_C	X X X X X X X X X X X X X X X X X X X	X X Documented X X X Not WPILB	X X X	Exec Test	ElevFF_MinAchieveVelocity.vi ElevFF_New_ZeroAccel.vi ElevFF_New.vi	Function Prototype	Notes Added 1/24/2022 Added 1/24/2022	Code Review	Test Program	క
HOL_DRV_C	X X X X X X X X	X X Documented X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Exec Test	ElevFF_MinAchieveVelocity.vi ElevFF_New_ZeroAccel.vi ElevFF_New.vi ElevFF_New.vi VI Name HolDrvCtrl_AdvCalculate_Trajectory.vi HolDrvCtrl_AdvCalculate.vi HolDrvCtrl_AtReference.vi	Function Prototype	Added 1/24/2022 Added 1/24/2022 Added 1/26/21	Code Review	Test Program	Error Checking
HOL_DRV_C	X X X X X X X X	X X Documented X X X Not WPILB	X X X X X X X	Exec Test	ElevFF_MinAchieveVelocity.vi ElevFF_New_ZeroAccel.vi ElevFF_New.vi ElevFF_New.vi VI Name HolDrvCtrl_AdvCalculate_Trajectory.vi HolDrvCtrl_AdvCalculate.vi	Function Prototype	Added 1/24/2022 Added 1/24/2022	Code Review	Test Program	ઇ

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Added additional do	cume	ntation.									
	X	X	X	Χ			HolDrvCtrl_Execute_Trajectory.vi		Added 1/24/2022		
	X	X	Χ	Χ			HolDrvCtrl Execute.vi		Future		
	Χ	X		Χ	SI		HolDrvCtrl New.vi		Added 1/26/21		
	X	Χ	Χ	Χ	SI		HolDrvCtrl PackExecuteSP.vi				
	X	Χ	X	X			HolDrvCtrl PackPID.vi		Added 1/24/2022		
	X	Χ	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		
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	đ	75			ptimized	utine Program			8	8	ing
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine Sample Prod	VI Name	Function Prototype	Code Review	Fest Progra	Error Checking
PID AUTOTUNE	X	7	\overline{X}	No		1- 3,	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		+		
					mized		IDAdioTallo_otop.vi				
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimiz	Test Routine Sample Program			Code Review	Test Program	Error Checking
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PID CONTROLLER	X	X	Χ	Χ			PIDController_AdvCalculate_FF_Sp_Pv_Per.vi		Advanced PID		
	Χ	X	Χ	Χ			PIDController AdvCalculate FF Sp Pv.vi		Advanced PID		
	X	X	X	X		X	PIDController_AdvExecute.vi		Labview style helper. Advanced PID		
	X	Χ		Χ	SI		PIDController_AtSetpoint.vi				
	X	Χ		Χ			PIDController_Calculate_PV.vi				
	X	Χ		Χ			PIDController_Calculate_SP_PV.vi				
	X	Χ		X	SI		PIDController_DisableContinousInput.vi				
	X	X		Χ	SI		PIDController_EnableContinousInput.vi				
	X	Χ	Χ	Χ		X	PIDController_Execute.vi		Labview style helper		
							PIDController_GetContinuousError.vi		OBSOLETE – Removed		
	X	X		Χ	SI		PIDController_GetPeriod.vi				
	X	X		Χ	SI		PIDController GetPID.vi				
	X	X		Χ	SI		PIDController GetPositionError.vi				
	Χ	Χ		Χ	SI		PIDController_GetSetpoint.vi				
	X	X			SI		PIDController GetTolerance.vi				
	X	X		Х	SI		PIDController GetVelocityError.vi				
	X	X		X	SI		PIDController IsContinuousInputEnabled.vi				
	X	X		X	1		PIDController New.vi				
	X	X		X	i		PIDController NewPeriod.vi				
	X	X	X	X	SI		PIDController Pack AdvLimits.vi				
	X	X	X	\overline{X}	SI		PIDController_Pack_AdvTuning.vi				
	X	X	\hat{X}	\overline{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	^		SI		PIDController_Pack_runing.vi PIDController Reset.vi				+
	X	X		X	SI		PIDController_Reset.vi PIDController SetD.vi				
	X		\ <u></u>	X					Advanced DID		
	X	X		X	SI		PIDController_SetDerivativeFilter.vi		Advanced PID		
	X	X		No			PIDController_SetFeedForward_OBSOLETE_DELETE.vi		Advanced PID, Obsolete – DELETE		
	X	X	X		SI		PIDController_SetFFGain_OBSOLETE_DELETE.vi PIDController Setl.vi		Advanced PID, Obsolete – DELETE		
		^		^	JI		PIDController SetInputRange.vi	+	OBSOLETE – Removed		+
	X	Χ		Χ	SI		PIDController_SetInputRange.vi PIDController_SetIntegratorRange.vi		OBSOLETE - Nemoved		+
		X		X	SI		PIDController_Set/OutputLimits.vi		Advanced PID		+
	X		^				PIDController_SetOutputLimits.vi		Auvaliceu Fib	-	+
	X	X		X	SI					+	+
	X	Χ	Χ	Χ	SI		PIDController_SetPeriod.vi				

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named library. Added additional do											
	X			λ		SI	PIDController_SetPID.vi				
	X	X				SI	PIDController_SetPIDF.vi	Advanced PID			
	X	X				SI	PIDController_SetSetpoint.vi				
	X	X		X		SI	PIDController_SetTolerance.vi				
	X	X		X		SI	PIDController_SetTolerancePandV.vi				
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PROFILED PID CONTROLLER	\overline{x}	X		$\overline{}$		SI	ProfiledPIDController AtGoal.vi	Tutalian Total Parameter Total		-	-
	X	X				SI	ProfiledPIDController AtSetpoint.vi				
	X	X		X		-	ProfiledPIDController Calculate Meas Go	ll vi			
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	X	X		X			ProfiledPIDController Calculate Meas Sta				
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	X	X		$\frac{1}{\lambda}$		SI	ProfiledPIDController DisableContInput.vi				
	X	X				SI	ProfiledPIDController EnableContInput.vi				
	X	X				I	ProfiledPIDController_Execute.vi	Single call LabVIEW style function.			
	X	X		X		SI	ProfiledPIDController GetGoal.vi				
	X	X				SI	ProfiledPIDController GetPeriod.vi				
	X	X				SI	ProfiledPIDController GetPID.vi	WPILIB has separate getters.			
	X	X				SI	ProfiledPIDController GetPositionError.vi	The same of the sa			
	X	X				SI	ProfiledPIDController GetSetpoint.vi				
	X	X				SI	ProfiledPIDController GetTolerance.vi				
	X	X		λ		SI	ProfiledPIDController_GetVelocityError.vi				
	X	X		X		1	ProfiledPIDController New.vi				
	X	X		X		1	ProfiledPIDController NewPeriod.vi				
	X	X				SI	ProfiledPIDController Reset PosOnly.vi				
	Χ	X				SI	ProfiledPIDController Reset PosVel.vi				
	X	X		λ		SI	ProfiledPIDController Reset.vi				
	X	X		X		SI	ProfiledPIDController_SetConstraints.vi				
	X	X				SI	ProfiledPIDController_SetGoal_PosOnly.vi				
	X	X				SI	ProfiledPIDController_SetGoal.vi				
	X	X				SI	ProfiledPIDController_SetIntegratorRange.v	i			
	X	X				SI	ProfiledPIDController_SetPID.vi				
	X	X		X		SI	ProfiledPIDController_SetTolerance_PosOr				
	X	X		λ		SI	ProfiledPIDController_SetTolerance_PosVe	l.vi			
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RAMSETE		X		λ	(5	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	Ramsete_Diff_DO_Eng.vi				
	X			X		X	Ramsete_Diff_DO_SI.vi	Harathia and H			
	X					1	Ramsete_Execute_ENG.vi	Use this one!!			
	X	X				SI	Ramsete_Execute_PackTuning_ENG.vi				
	X					SI I	Ramsete_Execute_PackTuning.vi Ramsete Execute.vi				
	X	X				I SI	Ramsete Lixecute.vi	now/h. zoto)			
	X					SI	Ramsete New.vi	new(b, zeta)			
	X	X				SI	Ramsete SetEnabled.vi	SetEnabled			
	X	X			7	SI	Ramsete SetTolerance.vi	SetTolerance			
	X					X	Ramsete SINC.vi	sinc internal			
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	duj	ροc	Not	Me	Exe	San	VI Name	Function Prototype	Notes	Ö	7es	Errc
SIMPLE MOTOR FEEDFORWARD		X	X	X	SI		SimpleMotorFF_Calculate_CalcAccel.vi	7.				
	Χ	Χ		Χ			SimpleMotorFF_Calculate_NextV_Dt.vi					
		X		X	SI		SimpleMotorFF_Calculate.vi	public double calculate(double velocity, double acceleration)				
•	X	X	X	Χ	SI		SimpleMotorFF_CalculateVelocityOnly.vi SimpleMotorFF_Ka_AutoTune.vi	public double calculate(double velocity)	-			
+	X	X	X	Х	X		SimpleMotorFF_MaxAchieveAccel.vi	public double maxAchievableAcceleration(double maxVoltage,	+			
							OITIPICIVICION 1 _IVIAXACINICVE/ACCOI.VI	double velocity)				
	X	X		X	X		SimpleMotorFF_MaxAchieveVel.vi	public double maxAchievableVelocity(double maxVoltage, double acceleration)				
	X	X		Х	X		SimpleMotorFF_MinAchieveAccel.vi	public double minAchievableAcceleration(double maxVoltage, double velocity)				
	X	X		X	X		SimpleMotorFF_MinAchieveVel.vi	public double minAchievableVelocity(double maxVoltage, double				
	X	Х		X	SI		SimpleMotorFF_New.vi	acceleration) public SimpleMotorFeedforward(double ks, double kv, double ka)				
•	X	X	X		SI		SimpleMotorFF_Pack_Ka_Tune_Params.vi					
								public SimpleMotorFeedforward(double ks, double kv)				
ļ								public Simplewotor reediorward (double ks, double kv)				
'=========												
GEOMETRY												
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	Χ	Χ		X	SI		CoordAxis_E.vi					
	Χ	Χ		Χ	SI		CoordAxis_N.vi					
	X	X		X			CoordAxis_New.vi					
	X	X		X	SI		CoordAxis_S.vi		+			
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	Implemente	ζn	₹	nu	ecution	mple				de	st F	9
			8	Ž			VI Name	Function Prototype	Notes	ပိ	7.6	En
COORDINATE SYSTEM	X	X		X	SI)		CoordSystem_Convert_Pose3d.vi					
	X	X		X	SI		CoordSystem_Convert_Rotation3d.vi					
		X				+	CoordSystem_Convert_Translation3d.vi			\longrightarrow		
+	X	X			SI)	,	CoordSystem_Convert_Transform3d.vi CoordSystem_EDN.vi					
		X			SI >		CoordSystem_NED.vi			+		
		X			SI)		CoordSystem_New.vi					
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ntation Lis	t												
additional do													
POSE2D		X			SI			Pose2d_Div.VI					
	X	X			SI			Pose2d_Equals.VI	boolean equals(other obj)				
	X	X)		X SI			Pose2d_Exp.vi Pose2d_getRotation.vi	pose2d exp(twist2d twist) rotation2d getRotation()	can also use cluster unpack			
-	X	X)		SI			Pose2d_getTranslation.vi	translation2d getTranslation()	can also use cluster unpack			
	X		X X		SI			Pose2d_getXY.vi	translation2d getrranslation()	can also use cluster unpack			
-	X	X	$X \rightarrow X$		SI			Pose2d_getXYAngle.vi					
	X	X)		1			Pose2d Interpolate.vi					
	Χ	X	7		X			Pose2d_Log.vi	twist2d log(pose2d end)				
	Χ	X	7		SI			Pose2d_Minus.vi	transform2d minus(pose2d other)				
	Χ	X)		SI		F	Pose2d_New_TRRO.vi	pose2d new(translation2d, rotation2d)				
	Χ	X			SI			Pose2d_New.vi	pose2d new(double x, double y, rotation2d)				
_	Χ	Χ)		SI			Pose2d_Plus.vi	pose2d plus(transform2d other)				
	X	X)		SI			Pose2d_RelativeTo.vi	pose2d relativeto(pose2d other)				
-	X	X			SI			Pose2d_Times.vi	and a contract of the contract	_			
	X	Χ)		SI		F	Pose2d_TransformBy.vi	pose2d transformby(transform2d other) pose2d new()	can use cluster constant			
l									poseza new()	can use cluster constant			
	Implemented	Documented	Not WPILIB		Execution Optimized	Test Routine	Sample Program	4 November 1	Function Posts to a	Maria	Code Review	Test Program	Error Checking
POSE3D			2 2			F		/I Name Pose3d Div.vi	Function Prototype	Notes	<u> </u>	F	Щ
POSESD	X	X)		SI SI			Pose3d_Equals.VI					
	X	X)		X			Pose3d_Equals.vi					
	X	X			SI			Pose3d_getRotation.vi					
-	X	X)		SI			Pose3d_getTranslation.vi					
-	X		X		SI			Pose3d_getXYZ.vi					
	Χ	X)		1			Pose3d_Interpolate.vi					
	Χ	X	7		X			Pose3d_Log.vi					
	Χ	X)		SI		F	Pose3d Minus.vi					
-	Χ	X)		SI		F	Pose3d_New.vi					
	Χ	X)		SI			Pose3d_New_Default.vi					
	Χ	Χ			SI			Pose3d_New_Pose2d.vi					
_	Χ	Χ			SI			Pose3d_New_Trans3dRot3d.vi					
-	X	X)		SI			Pose3d_Plus.vi					
-	X	X)		SI			Pose3d_RelativeTo.vi					
	X	X	V		SI			Pose3d_RotationVectorToMatrix.vi					
	X	X	/		SI			Pose3d_ToPose2d.vi					
	X	X)		SI SI			Pose3d_Times.vi Pose3d_TransformBy.vi		+			
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	Implemented	Documented	Not WPILIB		Execution Optimized	Test Routine	Sample Program	/I Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
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ERNION [X	7		SI			Quaternion_Get_All.vi					
TERNION	X				SI			Quaternion Get LVQuat.vi					
TERNION	Χ)	. ,				Quaternion_Get_Vect.vi					
TERNION		X)		SI			Quaternion_Get_W.vi		1			
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TERNION	X X X X X X X X	X X X X X X X)		SI SI SI SI SI SI			Quaternion_Inverse.vi Quaternion_New.vi Quaternion_New_Default.vi Quaternion_New_LVQuat.vi Quaternion_Normalize.vi					

WPILib LabVIEW Math Library – VI Implementation List
Revision 3.X 1/11/2023 – renamed library. Added additional documentation.

	Implemented	Documented	NOT WPILIB	Menu Item	Execution Optimiz	Test Routine	Sample Program	VI Name	Cunation Directory o	Notes	Code Review	Test Program	i.
TATION2D		$\frac{Q}{X}$			SI			Rotation2d_CreateAngle.vi	Function Prototype rotation2d new(double value)	Notes	0		<u>_</u>
I A I I ONZD		$\frac{\lambda}{X}$		\hat{X}	SI			Rotation2d_CreateAngleDegrees.vi	rotation2d fromDegrees(double degrees)	convert to radians then create			
		X			SI			Rotation2d_CreateAngleRotations.vi	Totationza nombegrees(double degrees)	convert to radians then create			
		X			SI			Rotation2d CreateXY.vi	rotation2d new(double x, double y)				
		X			SI			Rotation2d Div.vi					
		X			SI			Rotation2d_Equals.vi	boolean equals(rotation2d other)				
	Χ	Χ .			SI			Rotation2d_GetAngleCosSin.vi		New 1/26/21			
		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			
	V	V		V	C/			Detetioned CotDediene VI	deuble matDediene()	degree			
-		X X			SI SI			Rotation2d_GetRadians.VI Rotation2d GetRotations.vi	double getRadians()	use cluster unpack			
-		X			SI			Rotation2d_GetRotations.vi	double getSin()	use cluster unpack			+-
-	X	$\stackrel{\wedge}{X}$			SI			Rotation2d GetTan.VI	double getain()	can calculate			+-
-		X			SI			Rotation2d_Interpolate.vi	double gerrain()	Juli Saloulato			1
		X			SI			Rotation2d Minus.vi	rotation2d minus(rotation2d other)				T
		X			SI			Rotation2d_Plus.vi	rotation2d plus(rotation2d other)				
	Χ	Χ		X	SI			Rotation2d_RotateBy.vi	rotation2d rotateby(rotation2d other)				
	Χ	Χ			SI			Rotation2d_Times.vi	rotation2d times(double scalar)				
	Χ	Χ		X	SI			Rotation2d_UnaryMinus.vi	rotation2d unaryminus()				
									rotation2d new()	can use cluster constant			
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	Implementea	Documer	NOT WPILIB	Menu Ite	Execution	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	
ATION3D [Χ	Χ		X	<u> Skecution Optimized</u>	Test Rout		Rotation3d_Create_AxisAngle.vi	Function Prototype	Notes	Code Revi	Test Progr	
ATION3D	X	X X		X X	SI SI	Test Rout		Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi	Function Prototype	Notes	Code Revi	Test Progi	
ATION3D	X X X	X X X		X X X	SI SI SI	Test Rout		Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi	Function Prototype	Notes	Code Revi	Test Progi	
ATION3D	X X X X	X X X X		X X X	SI SI SI	Test Rout		Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi	Function Prototype	Notes	Code Revi	Test Progi	
ATION3D	X X X X	X X X X		X X X X X	SI SI SI I	Test Rout		Rotation3d Create AxisAngle.vi Rotation3d Create Default.vi Rotation3d Create Quaternion.vi Rotation3d Create InitialFinalVector.vi Rotation3d Create RollPitchYaw.vi	Function Prototype	Notes	Code Revi	Test Progr	
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ATION3D	X X X X X X	X X X X X X		X X X X X X	SI SI I SI I SI	Test Rout		Rotation3d Create AxisAngle.vi Rotation3d Create Default.vi Rotation3d Create Quaternion.vi Rotation3d Create InitialFinalVector.vi Rotation3d Create RollPitchYaw.vi Rotation3d Create RotMatrix.vi Rotation3d Div.vi	Function Prototype	Notes	Code Revi	Test Progr	
ATION3D	X X X X X X X	X X X X X X X		X X X X X X	SI SI I SI I SI SI SI	Test Rout		Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi Rotation3d_Create_RollPitchYaw.vi Rotation3d_Create_RotMatrix.vi Rotation3d_Div.vi Rotation3d_Equals.vi	Function Prototype	Notes	Code Revi	Test Progr	
TION3D	X X X X X X X X	X X X X X X X	X	X X X X X X X X	SI SI I SI I SI	Test Rout		Rotation3d Create AxisAngle.vi Rotation3d Create Default.vi Rotation3d Create Quaternion.vi Rotation3d Create InitialFinalVector.vi Rotation3d Create RollPitchYaw.vi Rotation3d Create RotMatrix.vi Rotation3d Div.vi	Function Prototype	Notes	Code Revi	Test Progr	
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ATION3D	X	X	X	X	SI SI SI SI SI SI SI SI	Test Routi		Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi Rotation3d_Create_RollPitchYaw.vi Rotation3d_Div.vi Rotation3d_Div.vi Rotation3d_Equals.vi Rotation3d_GetAxisAngle.vi Rotation3d_GetQuaternion.vi Rotation3d_GetXYZ.vi Rotation3d_Interpolate.vi Rotation3d_Minus.vi Rotation3d_Plus.vi	Function Prototype	Notes	Code Revi	Test Progr	
ATION3D	X	X	X	X	SI SI SI SI SI SI SI SI	Test Rout		Rotation3d Create AxisAngle.vi Rotation3d Create Default.vi Rotation3d Create Quaternion.vi Rotation3d Create InitialFinalVector.vi Rotation3d Create RollPitchYaw.vi Rotation3d Div.vi Rotation3d Div.vi Rotation3d Equals.vi Rotation3d GetAxisAngle.vi Rotation3d GetQuaternion.vi Rotation3d GetXYZ.vi Rotation3d Interpolate.vi Rotation3d Minus.vi Rotation3d Plus.vi Rotation3d Plus.vi Rotation3d RotateBy.vi	Function Prototype	Notes	Code Revi	Test Progr	
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FATION3D	X	X	X	X	SI SI SI SI SI SI SI SI	Test Rout		Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi Rotation3d_Create_RollPitchYaw.vi Rotation3d_Div.vi Rotation3d_Div.vi Rotation3d_Equals.vi Rotation3d_GetAxisAngle.vi Rotation3d_GetQuaternion.vi Rotation3d_GetXYZ.vi Rotation3d_Interpolate.vi Rotation3d_Minus.vi Rotation3d_Plus.vi	Function Prototype	Notes	Code Revi	Test Progr	
ATION3D	X X X X X X X X X X X X X X X X X X X	X	X	X	SI SI SI I SI SI SI SI	Test Rout		Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi Rotation3d_Create_RollPitchYaw.vi Rotation3d_Div.vi Rotation3d_Equals.vi Rotation3d_GetAxisAngle.vi Rotation3d_GetQuaternion.vi Rotation3d_GetXYZ.vi Rotation3d_Interpolate.vi Rotation3d_Minus.vi Rotation3d_Plus.vi Rotation3d_Plus.vi Rotation3d_RotateBy.vi Rotation3d_Times.vi	Function Prototype	Notes	, Code Revi	7 Test Progr	
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WPILib LabVIEW Math Library – VI Implementation List Revision 3.X 1/11/2023 – renamed library. Added additional docu

y. Added additional do		ntation.										
	X			SI			Transform2d_Div.vi					
	X	X	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \				Transform2d_Equals.VI	boolean equals(other transform2d)				
	X	X	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \				Transform2d_GetRotation.VI	rotation2d getRotation()	use cluster unpack			
	X	X	λ				Transform2d_GetTranslation.VI	translation2d getTranslation()	use cluster unpack			
	X		X X				Transform2d_GetXY.vi					
	X		X X				Transform2d_GetXYAngle.vi	t				
	X	X) X				Transform2d_Inverse.vi	transform inverse()	new			
	X	X	\ \ \ \ \ \	' Si 'SI			Transform2d_Plus.vi Transform2d Times.vi	transform2d times(double scalar)				
	X	۸		31			Transiorm2u_rimes.vi	transform2d times(double scalar) transform2d new()	can use cluster constant			
								transformed flew()	can use cluster constant			
TRANSFORM3D	X X X X X X X X X X X X X X X X X X X	N	Not WPILIB	SI			VI Name Transform3d_Create_Default.vi Transform3d_Create_Pose3dPose.3dvi Transform3d_Create_Trans3dRot3d.vi Transform3d_Div.vi Transform3d_Equals.VI Transform3d_GetRotation3d.VI Transform3d_GetTranslation3d.VI Transform3d_GetXYZ.vi Transform3d_Inverse.vi Transform3d_Plus.vi Transform3d_Times.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
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TRANSLATION2D	\sum_{X}^{∞}	X	X	SI		Sample	Translation2d_Create_DistAng.vi		Notes	Code Review	Test Program	
TRANSLATION2D	X	X		SI SI		Sample	Translation2d_Create_DistAng.vi Translation2d_Create.vi	Function Prototype translation2d new(double x, double y)	Notes	Code Review	Test Program	
TRANSLATION2D	X X X	X X X) X	SI SI		Sample	Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi	translation2d new(double x, double y)	Notes	Code Review	Test Program	
TRANSLATION2D	X X X X	X X X) X	SI SI SI SI		Sample	Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi Translation2d_Equals.vi		Notes	Code Review	Test Program	
TRANSLATION2D	X X X X	X X X X) X	SI SI SI SI		Sample	Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi Translation2d_Equals.vi Translation2d_GetAngle.vi	translation2d new(double x, double y) boolean equals(translation other)	Notes	Code Review	Test Program	
TRANSLATION2D	X X X X	X X X X X X)))))	SI SI SI SI SI SI SI SI		Sample	Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi Translation2d_Equals.vi	translation2d new(double x, double y)	Notes can use cluster unpack	Code Review	Test Program	
TRANSLATION2D	X X X X X X X	X X X X X X X))))))	SI SI SI SI SI SI SI SI		Sample	Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi Translation2d_Equals.vi Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other)		Code Review	Test Program	
TRANSLATION2D	X X X X X X X X X X X X X X X X X X X	X X X X X X X X))))))))	SI SI SI SI SI SI SI SI SI		Sample	Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi Translation2d_Equals.vi Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX()	can use cluster unpack can use cluster unpack	Code Review	Test Program	
TRANSLATION2D	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X	X	SI		Sample	Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi Translation2d_Equals.vi Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI Translation2d_GetY.VI Translation2d_GetY.VI	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm()	can use cluster unpack	Code Review	Test Program	
TRANSLATION2D	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X	X	SI		Sample	Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi Translation2d_Equals.vi Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI Translation2d_GetY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() double getY()	can use cluster unpack can use cluster unpack	Code Review	Test Program	
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TRANSLATION2D	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	SI		Sample	Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi Translation2d_Equals.vi Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI Translation2d_GetY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi Translation2d_Minus.vi Translation2d_Plus.vi	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() double getY() translation2d minus(translation2d other) translation2d plus(translation2d other)	can use cluster unpack can use cluster unpack	Code Review	Test Program	
TRANSLATION2D	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	SI		Sample	Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi Translation2d_Equals.vi Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI Translation2d_GetY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi Translation2d_Minus.vi Translation2d_Plus.vi Translation2d_RotateBy.vi	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() double getY() translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other)	can use cluster unpack can use cluster unpack	Code Review	Test Program	
TRANSLATION2D	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	SI		Sample	Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi Translation2d_Equals.vi Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI Translation2d_GetY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi Translation2d_Minus.vi Translation2d_Plus.vi Translation2d_RotateBy.vi Translation2d_Times.vi	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() double getY() translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar)	can use cluster unpack can use cluster unpack	Code Review	Test Program	
TRANSLATION2D	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	SI		Sample	Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi Translation2d_Equals.vi Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI Translation2d_GetY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi Translation2d_Minus.vi Translation2d_Plus.vi Translation2d_RotateBy.vi	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() double getY() translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar) translation2d unaryminus()	can use cluster unpack can use cluster unpack can use cluster unpack	Code Review	Test Program	
TRANSLATION2D	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	SI		Sample	Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi Translation2d_Equals.vi Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI Translation2d_GetY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi Translation2d_Minus.vi Translation2d_Plus.vi Translation2d_RotateBy.vi Translation2d_Times.vi	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() double getY() translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar) translation2d unaryminus() translation2d new()	can use cluster unpack can use cluster unpack can use cluster unpack can use cluster unpack	Code Review	Test Program	
	Implemented X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Not WPILIB	Execution Optimized	Test Routine	Sample Program Sample	Translation2d_Create_DistAng.vi Translation2d_Div.vi Translation2d_Equals.vi Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi Translation2d_Minus.vi Translation2d_Plus.vi Translation2d_RotateBy.vi Translation2d_Times.vi Translation2d_UnaryMinus.vi	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() double getY() translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar) translation2d unaryminus()	can use cluster unpack can use cluster unpack can use cluster unpack	Code Review	Test Program	
TRANSLATION2D	Implemented X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Not WPILIB	Execution Optimized	Test Routine	Sample Program Sample	Translation2d_Create_DistAng.vi Translation2d_Div.vi Translation2d_Equals.vi Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi Translation2d_Minus.vi Translation2d_Plus.vi Translation2d_RotateBy.vi Translation2d_Times.vi Translation2d_UnaryMinus.vi	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar) translation2d unaryminus() translation2d new() translation2d div(double scalar)	can use cluster unpack can use cluster unpack can use cluster unpack can use cluster unpack can use cluster unpack		Program	Checking

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Revision 3.A 1/11/2025 – Tenamed library. Added additional dol	X			X	3/		Translation3d_Create_DistAng.vi					
	X	X		$\frac{\lambda}{X}$	51		Translation3d Div.vi					
	X	X		X	31		Translation3d Equals.vi					
	X	Χ		X	31		Translation3d_GetDistance.vi					
		Χ		X S	SI		Translation3d_GetNorm.VI					
			Χ	X 3	SI		Translation3d_GetXYZ.vi					
		X		X S	5/		Translation3d_Interpolate.vi					
-		X		X S	S/		Translation3d_Minus.vi					
	X	X X		X S	51		Translation3d_Plus.vi					
		X		X S	51		Translation3d_RotateBy.vi Translation3d Times.vi					
		X		X S	21		Translation3d_Times.vi Translation3d_ToTranslation2d.vi					
	X	\hat{x}	_	\hat{X}	31		Translation3d_Torranslation2d.vi					
ı				^ .	5		Translation3u_onal yiviinus.vi					
	mplemented	Documented	Not WPILIB	Menu Item	Execution Optimize Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
TWIST2D	\overline{x}	X		$\frac{2}{X}$	<u> </u>	Τ ,	Twist2d_Create.vi	twist new(x, y, theta)	110100	$\overline{}$	<u> </u>	
		X			51		Twist2d_Equals.VI	boolean equals(obj other)				
	X				51		Twist2d GetAll.VI					
TWIST3D	× Implemented	X Documented			X Test Routine	Sample Progr	VI Name Twist3d_Create.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
		X		$X = \frac{1}{2}$	SI X		Twist3d_Equals.VI					
	X	X	X	X	SI X		Twist3d_GetAll.VI					
'====== KINEMATICS												
'=========				1	0 9 V							
	mplemented	ocumented	Not WPILIB	Menu Item	Execution Optimi Test Routine	Sample Program				ode Review	st Program	ror Checking
_	_	P0	ž			Š	VI Name	Function Prototype	Notes	ၓ		E
CHASSIS SPEEDS	X	X			S <i>I</i>		ChassisSpeeds_FromFieldRelativeChassisSpeeds.VI					
	X	X		X S	5/		ChassisSpeeds_FromFieldRelativeSpeeds.VI	chassisspeeds fromFieldRelativeSpeeds(double x, double y,				
	X	X	X	X S	5/		ChassisSPeeds_GetXYOmega.vi	double angvel, rotation2d robotangle)				
		X		$X = \frac{1}{2}$	51		ChassisSpeeds_New.vi	chassisspeeds new (double xvel, double yvel, double angvel)				
							-	chassisspeeds new ()	can use cluster constant			
•				,	n zen							1
	nented	nented	PILIB	Item	tion Optimiz Routine	le Program				Review	rogram	Checking

FRC_LabVIEW_Trajectory_Library_Routines.xlsx

DIFFERENTIAL DRIVE KINEMATICS X X X X X X X X X X

DiffKinematics_New.vi

DiffKinematics_toChassisSpeed.vi DiffKinematics_toWheelSpeed.vi Function Prototype diffDriveKine new(double trackWidth)

chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds) diffDriveWheelSpeed toWheelSpeeds(chassisSpeeds)

Notes

Revision 3.X 1/11/2023 – renamed library. Added additional documentation. Function Prototype **DIFFERENTIAL DRIVE ODOMETRY** DiffOdometry Execute.vi DONT NEED Χ 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() Function Prototype Notes DIFFERENTIAL DRIVE WHEEL SPEEDS diffDrWheelSpeeds new() diffDrWheelSpeeds new(double leftVel, double rightVel) XX Χ DiffWheel Normalize.vi void normalize(double maxVel) Function Prototype Notes MECANUM DRIVE KINEMATICS X X X MecaKinematics New.vi X X X X X X Χ MecaKinematics SetInverseKinematics.vi Χ MecaKinematics ToChassisSpeeds.vi MecaKinematics_ToTwist2d.vi Χ X X MecaKinematics_ToWheelSpeeds.vi Χ X X Χ MecaKinematics_ToWheelSpeedsZeroCenter.vi VI Name Function Prototype Notes MECANUM DRIVE MOTOR VOLTAGE nothing done Function Prototype Notes MECANUM DRIVE ODOMETRY MecaOdometry_Execute.vi MecaOdometry_GetKinematics.vi X X X MecaOdometry_GetPose.vi X X MecaOdometry New.vi X XX Χ MecaOdometry NewDefaultPose.vi XX Χ MecaOdometry_Reset.VI MecaOdometry Update.vi X XX MecaOdometry_UpdateWithTime.vi Removed...

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public SwerveDriveOdometry(SwerveDriveKinematics kinematics, X X X SwerveOdometry_NewZeroCenter.VI Rotation2d gyroAngle)
public void resetPosition(Pose2d pose, Rotation2d gyroAngle) SwerveOdometry ResetPosition.VI X X X $X \mid X \mid X \mid X$ SwerveOdometry Update4.VI For 4 module drives

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								werveOdometry_UpdateWithTime4.VI		REMOVED			
								werveOdometry_UpdateWithTimeX.VI		REMOVED			
	X	Χ	Χ	Χ			S	swerveOdometry_UpdateX.VI		uses array as input			
									public Pose2d updateWithTime(double currentTimeSeconds,	variable parameters (replace with			
									Rotation2d gyroAngle, SwerveModuleState moduleStates)	array and "4" calls)			
									public Pose2d update(Rotation2d gyroAngle, SwerveModuleState moduleStates)	variable parameters (replace with array and "4" calls)			
									SwervelvioduleState moduleStates)	array and 4 calls)			
SWERVE DRIVE MODULE POSITIONS	Implemented	< Documented	Not WPILIB	< Menu Item →	ଓ Execution Optimized	Test Routine		/I Name swerveModulePosition_CompareTo.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
SWERVE DRIVE MIDDULE POSITIONS		X		X									
	X	X		X	SI			SwerveModulePosition_Get.vi					
	Χ	Χ		X	SI		8	swerveModulePosition_New.vi					
SWERVE DRIVE MODULE STATE	X	X X Documented	Not WPILIB	X	ଓ ଓ ଅ Execution Optimized	Test Routine	9	/I Name swerveModuleState_CompareTo.vi swerveModuleState_Get.vi swerveModuleState_New.vi	Function Prototype public int compareTo(SwerveModuleState o) public SwerveModuleState(double speedMetersPerSecond, Rotation2d angle)	Notes	Code Review	Test Program	Error Checking
	X	X		X	SI		S	SwerveModuleState_Optimize.vi	public SwerveModuleState optimize(SwerveModuleState desired				
								_ '	Rotation2d angle)				
'======== SPLINE '========	plemented	ocumented	ot WPILIB	enu Item	cecution Optimized		ample Program				ode Review	sst Program	ror Checking
		Ď	_ ž	Ž	_Ŵ	<u>"</u>	<u>ري</u>	/I Name	Function Prototype	Notes	ŏ	¥	<u> </u>
CUBIC HERMITE SPLINE	X	X		X			C	CubicHermiteSpline_getControlVectorFromArrays.vi	protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector)	not needed, use cluster unpack			
	X	X		X			C	CubicHermiteSpline_makeHermiteBasis.vi	private SimpleMatrix makeHermiteBasis()				
	X	Х		X				CubicHermiteSpline_New.vi	public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector)				
POSE WITH CURVATURE	K Implemented	X Documented	Not WPILIB	X Menu Item	ල Execution Optimized			/I Name PoseWithCurve_New.vi	Function Prototype public PoseWithCurvature(Pose2d poseMeters, double	Notes	Code Review	Test Program	Error Checking
FOSE WITH CORVATURE	^	^		^	31			OSCANITIONI AGTIACAN'AI	curvatureRadPerMeter)				
									public PoseWithCurvature()	can use cluster constant			
									public Pose2d poseMeters	not needed, use cluster unpack			
					+		_		public double curvatureRadPerMeter	not needed, use cluster unpack			
									Pasio asasio sai vatarsi tadi sirvista	not needed, use cluster unpack	l.		

Revision 3.X 1/11/2023 – renamed library. Added additional documentation. Execution Optimized Routine Venu Item Function Prototype Notes QUINTIC HERMITE SPLINE private SimpleMatrix getControlVectorFromArrays(double[] QuinticHermiteSpline getControlVectorFromArrays.vi initialVector, double[] finalVector) QuinticHermiteSpline makeHermiteBasis.vi private SimpleMatrix makeHermiteBasis() X X X public QuinticHermiteSpline(double[] xInitialControlVector, QuinticHermiteSpline_New.vi double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector)
protected SimpleMatrix getCoefficients() not needed, use cluster unpack Routine ltem Function Prototype Notes SPLINE (Abstract class) 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 Execution Optii rest Routine Function Prototype Notes SPLINE HELPER SplineHelp GetCubicCtrlVector.vi private static Spline.ControlVector getCubicControlVector(double scalar, Pose2d point)
public static Spline.ControlVector[] SplineHelp GetCubicCtrlVectorsFromWayPts.vi Χ getCubicControlVectorsFromWaypoints(Pose2d start, Translation2d[] interiorWaypoints, Pose2d end) SplineHelp GetCubicCtrlVectorsFromWeightedWayPts.vi Χ X X X X X No SplineHelp GetCubicSpline Calc1.vi internal Χ X X No SplineHelp GetCubicSpline Calc2.vi internal Χ X X No SplineHelp GetCubicSpline Calc3.vi internal X X Χ SplineHelp getCubicSplinesFromControlVectors.vi public static CubicHermiteSpline[] getCubicSplinesFromControlVectors(Spline.ControlVector start, Translation2d[] waypoints, Spline.ControlVector end) X SI SplineHelp_GetQuinticCtrlVector.vi XX private static Spline ControlVector getQuinticControlVector(double scalar, Pose2d point) public static List<Spline.ControlVector> SplineHelp_GetQuinticCtrlVectorsFromWayPts.vi REMOVED 2762 getQuinticControlVectorsFromWaypoints(List<Pose2d> waypoints) SplineHelp_GetQuinticCtrlVectorsFromWeightedWayPts.vi REMOVED 2762 public static QuinticHermiteSpline[] SplineHelp getQuinticSplinesFromControlVectors.vi getQuinticSplinesFromControlVectors(Spline.ControlVector[] controlVectors) SplineHelp GetQuinticSplinesFromWeightedWayPts.vi Χ $X \mid X \mid$ X New 2762 X SplineHelp GetQuinticSplinesFromWayPts.vi X Χ New 2762 Χ No SplineHelp ThomasAlgorithm.vi private static void thomasAlgorithm(double[] a, double[] b, double[] internal c, double[] d, double[] solutionVector) Execution Optimized Sample Program Routine Not WPILIB Menu Item SPLINE PARAMETERIZER X public static List<PoseWithCurvature> parameterize(Spline spline, SplineParam Spline T0 T1.vi double t0, double t1)

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evision 3.X 1/11/2023 – renamed library. Added additional do	cumer	ntation	٦.							
	X	X		X	X	SplineParam Spline.vi	public static List <posewithcurvature> parameterize(Spline spline)</posewithcurvature>			
	Χ	X	X	No		SplineParam_StackGet.vi		internal		
	Χ	Χ	X	No		SplineParam_StackPop.vi		internal		
	Χ	Χ	X	No		SplineParam_StackPush.vi		internal		

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program NI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
TRAJECTORY	Χ	Χ		X			Trajectory_Concatenate.vi					
	Χ	X		Χ			Trajectory_equals.vi	boolean equals(other obj)	FUTURE			
	Χ	Χ		X	SI		Trajectory_GetStates.vi	public List <state> getStates()</state>	not needed, use unpack			
	Χ	Χ		Χ	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	Χ		X	SI		Trajectory_New_Empty.vi					
	X	X		X	SI		Trajectory_New.vi	public Trajectory(final List <state> states)</state>				
	Χ	X		Χ			Trajectory_RelativeTo.vi	public Trajectory relativeTo(Pose2d pose)				
	Χ	X		Χ			Trajectory_Sample.vi	public State sample(double timeSeconds)				
	X	X	X	X			Trajectory_SampleReverse.vi		Sample in reverse order. Negate sample.			
	Χ	X		Χ			Trajectory_TransformBy.vi	public Trajectory transformBy(Transform2d transform)				
								public Pose2d getInitialPose()	can use cluster unpack, array index			

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Nample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
TRAJECTORY CONFIG	X	X		X			TrajectoryConfig_AddConstraint.vi	public TrajectoryConfig addConstraint(TrajectoryConstraint constraint)	Implemented differently, can't duplicate.			
	X	X		X			TrajectoryConfig_AddConstraints.vi	public TrajectoryConfig addConstraints(List extends<br TrajectoryConstraint> constraints)	Implemented differently, can't duplicate.			
	X	X		X	SI		TrajectoryConfig_Create.vi	public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSg)	·			
	X	Χ		Χ			TrajectoryConfig_GetCentripetalAccel.vi	"				
	X	X	X	X			TrajectoryConfig_GetConstraints.vi	public List <trajectoryconstraint> getConstraints()</trajectoryconstraint>	Implemented differently, can't duplicate.			
	X	X		X			TrajectoryConfig_GetEndVelocity.vi	public double getEndVelocity()	can use cluster unpack			

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docume	ntatior	١.							
X	Χ		X		TrajectoryConfig_GetKinematicsDiffDrive.vi				
X	X		X		TrajectoryConfig_GetKinematicsMecanumfDrive.vi				
X	Χ		Χ		TrajectoryConfig_GetKinematicsSwerveDrive.vi				
X	Χ	X	X		TrajectoryConfig_GetMaxVelAccel.vi				
X	Χ		X		TrajectoryConfig_GetStartVelocity.vi	public double getStartVelocity()	can use cluster unpack		
X	Χ		X		TrajectoryConfig_GetVoltageDiffDrive.vi				
X	Χ		Χ		TrajectoryConfig_IsReversed.vi	public boolean isReversed()	can use cluster unpack		
X	Χ	X	Χ	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	Χ		X	SI	TrajectoryConfig_setReversed.vi	public TrajectoryConfig setReversed(boolean reversed)			
X	X		X		TrajectoryConfig_SetStartVelocity.vi	public TrajectoryConfig setStartVelocity(double startVelocityMetersPerSecond)			
X	Χ	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 WOLTH DOLLTINES FOR STUES			

NOTE ADD OTHER "SET" ROUTINES FOR OTHER CONTRAINTS HERE, SINCE NEW CONTRAINTS ARE

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	rest Koutine Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
TRAJECTORY GENERATE	X	X	ı	X			TrajectoryGenerate_Make_Cubic_CtrlVect.vi	public static Trajectory generateTrajectory(Spline.ControlVector initial, List <translation2d> interiorWaypoints, Spline.ControlVector end, TrajectoryConfig config)</translation2d>				
	X	X		X			TrajectoryGenerate_Make_Cubic.vi	end, TrajectoryConfig config) public static Trajectory generateTrajectory(Pose2d start, List <translation2d> interiorWaypoints, Pose2d end, TrajectoryConfig config)</translation2d>	uses cubic splines			
	X	X	X	X			TrajectoryGenerate Make Generic.vi	TrajectoryConfig config) 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	Χ		Х			TrajectoryGenerate_Make_Quintic.vi	public static Trajectory generateTrajectory(List <pose2d> waypoints, TrajectoryConfig config)</pose2d>	uses quintic splines			
							To all and a second a second and a second an	multip static List of Descalation Comments and				
	X	X		X			TrajectoryGenerate_splinePointsFromSplines.vi	public static List <posewithcurvature> splinePointsFromSplines(Spline[] splines)</posewithcurvature>				
	X x	ą	Vot WPILIB	ltem	execution Optimized	est Koutine Sample Program		splinePointsFromSplines(Spline[] splines)	Notes	ode Review	est Program	error Checking
TRAJECTORY GENERATE (Control Vector)	Implemented	Documented	Not WPILIB		Execution Optimized	l est Routine Sample Program	VI Name	splinePointsFromSplines(Spline[] splines) Function Prototype	Notes may not need, just data	Code Review	Test Program	Error Checking
TRAJECTORY GENERATE (Control Vector)	Implemented	ą	Not WPILIB	ltem	Execution Optimized	Sample Program		splinePointsFromSplines(Spline[] splines) Function Prototype public ControlVectorList(int initialCapacity)	may not need, just data	Code Review	Test Program	Error Checking
TRAJECTORY GENERATE (Control Vector)	Implemented	ą	Not WPILIB	ltem	Execution Optimized	Sample Program		splinePointsFromSplines(Spline[] splines) Function Prototype		Code Review	Test Program	Error Checking
TRAJECTORY GENERATE (Control Vector)	Implemented	Cumented Documented		Menu Item	otimized Exec	ram Sample	VI Name	Function Prototype public ControlVectorList(int initialCapacity) public ControlVectorList() public ControlVectorList(Collection extends Spline.ControlVector collection)	may not need, just data		am Test	Checking
TRAJECTORY GENERATE (Control Vector)	Implemented	Documented	Not WPILIB	ltem	Execution Optimized Execution Optimized Test Doutine	ram Sample		Function Prototype public ControlVectorList(int initialCapacity) public ControlVectorList() public ControlVectorList() public ControlVectorList(Collection extends</td <td>may not need, just data may not need, just data</td> <td>Code Review Code Review</td> <td>Test Program</td> <td></td>	may not need, just data may not need, just data	Code Review Code Review	Test Program	

Revision 3.X 1/11/2023 – renamed library. Added additional documentation. TrajectoryParam calcStuffRev.vi X X X No Χ TrajectoryParam enforceAccel.vi No private static void enforceAccelerationLimits(boolean reverse, his routines needs to be changed List<TrajectoryConstraint> constraints, ConstrainedState state) when new constraints are added. TrajectoryParam enforceVelocity.vi This routines needs to be changed Χ No when new constraints are added. X X Χ TrajectoryParam timeParam.vi public static Trajectory timeParameterizeTrajectory(List<PoseWithCurvature> points. List<TrajectoryConstraint> constraints, double startVelocityMetersPerSecond, double endVelocityMetersPerSecond, double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq, boolean reversed) Optim Routine Venu Item Function Prototype VI Name Notes TRAJECTORY PARAMETERIZE CONSTRAINED STATE 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 $X \mid X \mid X \mid X$ ConstrainedState SetVelAccel.vi X X X X ConstrainedState_SetVelocity.vi ConstrainedState() ltem Function Prototype VI Name Notes TRAJECTORY UTIL X TrajectoryUtil fromPathWeaverJSON.vi public static Trajectory fromPathweaverJson(Path path) Χ X TrajectoryUtil MakeWeightedWayPoint ENG.vi Χ X TrajectoryUtil MakeWeightedWayPoint.vi X X X X Χ TrajectoryUtil toPathWeaverJSON.vi public static void toPathweaverJson(Trajectory trajectory, Path Χ public static Trajectory deserializeTrajectory(String json) public static String serializeTrajectory(Trajectory trajectory) Execution Optin ltem Function Prototype Notes TRAPEZOID PROFILE X TrapProfConstraint New.vi Χ X Χ TrapProfile Calculate.vi X X X TrapProfile Direct.vi Χ No Private, remove from menu X X XX TrapProfile Execute.vi X X X SI TrapProfile_Execute_AtGoal.vi XX Χ TrapProfile IsFinished.vi XX Χ TrapProfile New DefInitial.vi XX Χ TrapProfile New.vi $X \mid X$ No TrapProfile ShouldFlipAcceleration.vi Private, remove from menu XX X TrapProfile TimeLeftUntil.vi Χ Χ TrapProfile_TotalTime.vi Χ Χ TrapProfState Equals.vi Χ Χ Χ Χ X TrapProfState New.vi

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TRAJECTORY CONSTRAINT

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DIFF DRIVE KINEMATIC CONSTRAINT X	abVIEW Math Library – VI Implementation Lis										
CENTRIPETAL ACCELERATION CONSTRAINT X X X X X X X X X X X X X X X X X X X							ine	rogram			
DIFF DRIVE KINEMATIC CONSTRAINT X X X X X X X X X X X X X X X X X X X				Not WPILI		Execution	Test Routi	Sample Pr			Notes
DIFF DRIVE KINEMATIC CONSTRAINT X X X X X X X X X X X X X X X X X X X	CENTRIPETAL ACCELERATION CONSTRAINT	X	X		X				CentripetalAccelConstraint_getMaxVelocity.vi	poseMeters, double curvatureRadPerMeter, double	
DIFF DRIVE KINEMATIC CONSTRAINT Page Pa		Х	X		X				CentripetalAccelConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters,	
DIFF DRIVE KINEMATIC CONSTRAINT V		X	X		X	SI			CentripetalAccelConstraint_New.vi		Can use cluster pack for no
DIFF DRIVE KINEMATIC CONSTRAINT X						nized		r L			
DIFF DRIVE KINEMATIC CONSTRAINT X X X X X X X X X X X X X X X X X X X		plemented	ocumented	ot WPILIB	enu Item		st Routine	mple			
DiffDriveKinematicsConstraint_getMinMaxAccel.vi poseMeters, double curvatureRadPerMeter, double yelocit/ModestaPerSecondSuffOrea2d poseMeters, double curvatureRadPerMeter, double yelocit/ModestaPerSecondSuffOrea2d poseMeters, double curvatureRadPerMeter, double yelocit/ModestaPerSecondSuffOrea2d poseMeters, double curvatureRadPerMeter, double yelocityMetersPerSecondSuffOrea2d poseMeters, double yelocityMetersPerSecondSuffOrea2d yelocityMetersPerSecondSuffOrea2d poseMeters, double curvatureRadPerMeter, double yelocityMetersPerSecondSuffOrea2d poseMeters, double yelocityMetersPerSecond	DIFF DRIVE KINEMATIC CONSTRAINT			_ ₹		Щ		Š		public double getMaxVelocityMetersPerSecond(Pose2d	Notes
Differential DriveKinematics kinematics, double maxSpeedMetersPerSecond) Part Par										poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSg(Pose2d poseMeters,	
DIFF DRIVE VOLTAGE CONSTRAINT V		Х	X		X	SI			DiffDriveKinematicsConstraint_New.vi	DifferentialDriveKinematics kinematics, double	
DIFF DRIVE VOLTAGE CONSTRAINT X		Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
DiffDriveVoltageConstraint_getMinMaxAccel.vi DiffDriveVoltageConstraint_getMinMaxAccel.vi DiffDriveVoltageConstraint_getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) DiffDriveVoltageConstraint_New.vi DiffDriveVoltageConstraint_New.vi DiffDriveVoltageConstraint_New.vi DiffDriveVoltageConstraint_New.vi DiffDriveVoltageConstraint_New.vi DiffDriveVoltageConstraint_New.vi DiffDriveVoltageConstraint_New.vi DiffDriveVoltageConstraint_New.vi Public DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage) Patential DriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics, double maxVoltage) Patential DriveVoltageConstraint(SimpleMotorFeedforward, DifferentialDriveVoltageConstraint(SimpleMotorFeedforward) Patential DriveVoltageConstraint(SimpleMotorFeedforward) Patential DriveVoltageConstraint(SimpleMotorF	DIFF DRIVE VOLTAGE CONSTRAINT		X						DiffDriveVoltageConstraint_getMaxVelocity.vi	poseMeters, double curvatureRadPerMeter, double	
DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage) Pattern Pat		X	X		X				DiffDriveVoltageConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSg(Pose2d poseMeters,	
ELLIPTICAL REGION CONSTRAINT X X X EllipRegionConstraint_getMaxVelocity.vi		X	X		X	SI			DiffDriveVoltageConstraint_New.vi	DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double	
ELLIPTICAL REGION CONSTRAINT X X X X EllipRegionConstraint_getMaxVelocity.vi						nized		μ			
ELLIPTICAL REGION CONSTRAINT X X EllipRegionConstraint_getMaxVelocity.vi		nplemented	ocumented	ot WPILIB	1enu Item		est Routine	mple	VI Name	Function Prototyne	Notes
X X X EllipRegionConstraint_getMinMaxAccel.vi	ELLIPTICAL REGION CONSTRAINT	X	X	<		E	1		EllipRegionConstraint_getMaxVelocity.vi EllipRegionConstraint_getMinMaxAccel.vi	т аполот гтологуре	INOIGS
X X X EllipRegionConstraint_IsPoseInRegion.vi X X X X EllipRegionConstraint_New.vi		X	X		X				EllipRegionConstraint_IsPoseInRegion.vi		

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X 1/11/2023 – renamed library. Added additional do	cumer	ntation.							•	
JERK CONSTRAINT	/ / Implemented	Documented	X X Not WPILIB	Menu Item	ত Execution Optimized	Test Routine	Sample Program	JerkConstraint_getMaxVelocity.vi JerkConstraint_getMinMaxAccel.vi	Routine exists, it is just a shell Routine exists, it is just a shell	Notes FUTURE FUTURE FUTURE
MAX VELOCITY CONSTRAINT	X X /mplemented	X X Documented	Not WPILIB	X X Menu Item	ର ଓ Execution Optimized	Test Routine	Sample Program	VI Name MaxVelocityConstraint_getMaxVelocity.vi MaxVelocityConstraint_getMinMaxAccel.vi MaxVelocityConstraint_New.vi	Function Prototype	Notes
MECANUM DRIVE KINEMATICS CONSTRAINT	X X Implemented	X X Documented	Not WPILIB	X X Menu Item	ত Execution Optimized	Test Routine		VI Name MecaDriveKinematicsConstraint_getMaxVelocity.vi MecaDriveKinematicsConstraint_getMinMaxAccel.vi MecaDriveKinematicsConstraint_New.vi	Function Prototype	Notes
RECTANGULAR REGION CONSTRAINT	X X Implemented	X X Documented	Not WPILIB	X X Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name RectRegionConstraint_getRectRegion.vi RectRegionConstraint_getMinMaxAccel.vi RectRegionConstraint_lsPoseInRegion.vi RectRegionConstraint New.vi	Function Prototype	Notes
SWERVE DRIVE KINEMATICS CONSTRAINT	X mplemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine		VI Name SwerveDriveKinematicsConstraint_getMaxVelocity.vi SwerveDriveKinematicsConstraint_getMinMaxAccel.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	Notes
	X	X		X	SI				Newpublic SwerveDriveKinematicsConstraint(final SwerveDriveKinematics kinematics, double maxSpeedMetersPerSecond)	Can use cluster pack for now

FRC_LabVIEW_Trajectory_Library_Routines.xlsx

Revision 3.X 1/11/2023 – renamed library. Added additional documentation.

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VIN
TRAJECTORY CONSTRAINT	X	X	X	X				Traj

Implemen	Document	Not WPIL	Menu Iten	Execution	Test Rout	ର	Function Prototype	Notes
X	X	X	X			TrajConstraint_GetMaxVelocity.vi		
X	X	Χ	Χ			TrajConstraint_GetMinMaxAccel.vi		
X	Χ	Χ	Χ			TrajConstraint_GetType.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name
TRAJECTORY CONSTRAINT (Min Max)	X	X		X	SI			Constraint_
	Χ	Χ		Χ	SI			Constraint_
·								

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 VI Name
 Function Prototype
 Notes

 Constraint MinMax New.vi
 Constraint MinMax New

 Constraint MinMax NewMinMax.VI
 Constraint MinMax New

'===== UTILITY

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

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

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CONVERSIONS

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

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WPILib LabVIEW Math Library – VI Implementation List
Revision 3.X 1/11/2023 – renamed library. Added additional documentation.
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	Χ	SI			Conv_AngleDegrees_Heading.vi		
	Χ	Χ	X	Χ	SI			Conv_AngleRadians_Heading.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Centimeters_Meters.vi		
	Χ	Χ	X	Χ	SI			Conv_Deg_Radians.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Deg_Rotations.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Feet_Meters.vi		
	Χ	Χ	Χ	Χ	SI			Conv_GyroDegrees_Heading.vi		
	Χ	Χ	X	Χ	SI			Conv_Heading_AngleRadians.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Inches_Meters.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Kilograms_Pounds.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Meters_Feet.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Meters_Inches.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Pose2d_SI_Eng.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Pounds_Kilograms.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Radians_Deg.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Radians_Rotations.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Rotations_Deg.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Rotations_Radians.vi		
	X	Χ	X	X	SI			Conv_Yards_Meters.vi		

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

'======== PATHFINDER UTIL

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimizea	Test Routine	Sample Program NI Name	Function Prototype	Notes
PATHFINDERUTIL	Χ	Χ	Χ	Χ			PathfinderUtil_Continuous_Heading_Difference.vi		
	Χ	Χ	Χ	Χ			PathfinderUtil_OptimizeTrajectoryStates.vi		
	Χ	Χ	Χ	Χ			PathfinderUtil_ToTrajectory.vi		

FRC_LabVIEW_Trajectory_Library_Routines.xlsx Page 23 / 39 Revision 3.X 1/11/2023 – renamed library. Added additional documentation.

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 Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DC MOTOR		Χ		Χ	SI	DCMotor_GetAndymark9015.vi					
	Χ	Χ		Χ	SI	DCMotor_GetAndymarkRs775_125.vi					
	Χ	Χ		Χ	SI	DCMotor_GetBag.vi					
	Χ	Χ		Χ	SI	DCMotor_GetBanebotsRs550.vi					
	Χ	Χ		Χ	SI	DCMotor_GetBanebotsRs775.vi				1	
	Χ	Χ		Χ	SI	DCMotor_GetCIM.vi					
	Χ	Χ		Χ	SI	DCMotor_GetCurrent.vi					
	Χ	Χ		Χ	SI	DCMotor_GetFalcon500.vi				í	
	Χ	Χ		Χ	SI	DCMotor_GetMiniCIM.vi					
	Χ	Χ		Χ	SI	DCMotor_GetNEO.vi					
	Χ	Χ		Χ	SI	DCMotor_GetNEO550.vi					
	Χ	Χ		Χ	SI	DCMotor GetRomiBuiltIn.vi					
	Χ	Χ		Χ	SI	DCMotor_GetVex775Pro.vi					
	Χ	Χ		Х	SI	DCMotor_New.vi					
	Χ	Χ		Χ	SI	DCMotor_PickMotor.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
LINEAR SYSTEM ID	Χ	Χ		X			LinearSystemId_CreateDCMotorSystem.vi					
	Χ	Χ		Χ			LinearSystemId_CreateDriveTrainVelocitySystem.vi		Update to use create matrix			
	Χ	Χ		X			LinearSystemId_CreateElevatorSystem.vi		Update to use create matrix		1	
	X	X		X			LinearSystemId_CreateFlywheelSystem.vi		Update to use create matrix		,	
	X	Χ		X			LinearSystemId_CreateSingleJointedArmSystem.vi		Update to use create matrix		,	
	Χ	Χ		X			LinearSystemId_IdentifyDriveTrainSystem.vi		Update to use create matrix			
	Χ	Χ		Χ			LinearSystemId_IdentifyPositionSystem.vi		Update to use create matrix			
	Χ	Χ		Χ			LinearSystemId_IdentifyVelocitySystem.vi		Update to use create matrix			
	_											

'====== STATE SPACE ESTIMATION '=======

> VI Name Function Prototype Notes DIFFERENTIAL DRIVE POSE ESTIMATOR X XX DiffDrivePoseEst AddVisionMeasurement.vi X DiffDrivePoseEst_FillStateVector.vi DiffDrivePoseEst GetEstimatedPosition.vi Χ DiffDrivePoseEst_Kalman_F_Callback.vi Χ DiffDrivePoseEst_Kalman_H_Callback.vi Χ DiffDrivePoseEst_New.vi XX Χ DiffDrivePoseEst ResetPosition.vi XX Х DiffDrivePoseEst SetVisionMeasurementStdDevs.vi

on 3.X 1/11/2023 – renamed library. Added additional de	st ocumentation							
713.X 1717/2023 - Tellamed library. Added additional di	XX				DiffDrivePoseEst_Update.vi			
	X X	X			DiffDrivePoseEst_UpdateWithTime.vi			
	XX	X			DiffDrivePoseEst VisionCorrect Callback.vi			
	XX				DiffDrivePoseEst VisionCorrect Kalman H Callback.vi			
EXTENDED KALMAN FILTER	X X X X X X X X X X X X X X X X X X X	X		Test Routine Samula Drousam	ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_GetP_Single.vi ExtendedKalmanFilter_GetP_Vi ExtendedKalmanFilter_GetXHat_Single.vi ExtendedKalmanFilter_GetXHat_Single.vi ExtendedKalmanFilter_GetXHat.vi ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Reset.vi	Code Review	Test Program	Error Chaoking
	XX				ExtendedKalmanFilter_SetP.vi			<u> </u>
	XX				ExtendedKalmanFilter_SetXHat_Single.vi ExtendedKalmanFilter SetXHat.vi			
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KALMAN FILTER	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Exec	X X X X X X X X X X X X X X X X X X X	KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHaT_Single KalmanFilter_New.vi KalmanFilter_Predict.vi	Code Reviev	Test P	L
KALMAN FILTEI	\$\\ \frac{\x}{x} \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	X	Exec	X X	KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHaT_Single KalmanFilter_New.vi	Code F	Test P	
KALMAN FILTEF	\$\\ \frac{\x}{x} \ \f	X	Exec	X X	KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHaT_Single KalmanFilter_New.vi KalmanFilter_Predict.vi KalmanFilter_Reset.vi	Code F	Test P	
KALMAN FILTE	\$\\ \frac{\x}{x} \ \f	X	Exec	X X X X X	KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHaT_Single KalmanFilter_New.vi KalmanFilter_Predict.vi KalmanFilter_Reset.vi KalmanFilter_Reset.vi	Code F	Test P	
	May be a second of the second	Not WPILIB Wenu Item	Execution Optimized Execution Distribution Optimized	X X X X X	KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_New.vi KalmanFilter_Predict.vi KalmanFilter_Predict.vi KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat Single Function Prototype Notes	Code Review Code F	Test Program Test P	
KALMAN FILTER LATENCY COMPENSATOR	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Execution Optimized Exec	wtine X X X X Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y	KalmanFilter_Correct.vi KalmanFilter_GetK_Single.vi KalmanFilter_GetX_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_New.vi KalmanFilter_Predict.vi KalmanFilter_Reset.vi KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat_Single VI Name Function Prototype Notes KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi	Review	ram	
		X X X X X X X X X X X X X X X X X X X	Execution Optimized Exec	wtine X X X X Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y	KalmanFilter_GetK KalmanFilter_GetK Single vi KalmanFilter_GetX Single vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_New.vi KalmanFilter_Predict.vi KalmanFilter_Predict.vi KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat Single VI Name KalmanFilter_SetXHat_Single Notes KalmanFilter_LatencyComp_AddObserverState.vi KalmanFilter_LatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilter_LatencyComp_ApplyPastGlobalMeasurement_UKF.vi	Review	ram	
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MECANUM DRIVE POSE ESTIMATOR	R			T		MecaDrivePoseEst AddVisionMeasurement StdDev.vi	71				
	X		X			MecaDrivePoseEst_AddVisionMeasurement.vi					
	X		X			MecaDrivePoseEst_GetEstimatedPosition.vi					
	X	X	No	2		MecaDrivePoseEst_Kalman_F_Callback.vi					
		X	No.			MecaDrivePoseEst_Kalman_H_Callback.vi MecaDrivePoseEst New.vi				 	
		X	$\frac{\lambda}{X}$			MecaDrivePoseEst_ResetPosition.vi					
		X	X			MecaDrivePoseEst_SetVisionMeasurementStdDevs.vi					
		Χ	X			MecaDrivePoseEst_Update.vi					
		X	X			MecaDrivePoseEst_UpdateWithTime.vi					
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	X	X	X			SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi					
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		X	X			SwerveDrivePoseEst Kalman H Callback.vi					
		Χ	X			SwerveDrivePoseEst_New.vi					
		X	X			SwerveDrivePoseEst_ResetPosition.vi					
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UNSCENTED KALMAN FILTE	X	X X	We Not	Exec	st	UnscentedKalmanFilter_Correct_FuncGroup.vi UnscentedKalmanFilter_Correct_OnlyUY.vi	Function Prototype	Notes	Code Review	Test Program	Frror Checking
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UNSCENTED KALMAN FILTE	X X X X X	X X X X X X X X X X X X X X X X X X X	X	Exec	st	UnscentedKalmanFilter_Correct_FuncGroup.vi UnscentedKalmanFilter_Correct_OnlyUY.vi UnscentedKalmanFilter_Correct_OnlyUYR.vi UnscentedKalmanFilter_Correct.vi UnscentedKalmanFilter_GetP_Single.vi UnscentedKalmanFilter_GetP.vi UnscentedKalmanFilter_GetXHat_Single.vi	Function Prototype	Notes	Code Review	Test Program	Fror Checking
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UNSCENTED KALMAN FILTE	X X X X X X X	X X X X X X X X X X X X X X X X X X X	to	Exec	st	UnscentedKalmanFilter_Correct_FuncGroup.vi UnscentedKalmanFilter_Correct_OnlyUY.vi UnscentedKalmanFilter_Correct_OnlyUYR.vi UnscentedKalmanFilter_Correct.vi UnscentedKalmanFilter_GetP_Single.vi UnscentedKalmanFilter_GetP.vi UnscentedKalmanFilter_GetXHat_Single.vi UnscentedKalmanFilter_GetXHat_Vi UnscentedKalmanFilter_GetXHat.vi UnscentedKalmanFilter_New_Default.vi	Function Prototype	Notes	Code Review	Test Program	Error Checkina
UNSCENTED KALMAN FILTE	X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	Exec	st	UnscentedKalmanFilter_Correct_FuncGroup.vi UnscentedKalmanFilter_Correct_OnlyUY.vi UnscentedKalmanFilter_Correct_OnlyUYR.vi UnscentedKalmanFilter_Correct.vi UnscentedKalmanFilter_GetP_Single.vi UnscentedKalmanFilter_GetP.vi UnscentedKalmanFilter_GetXHat_Single.vi UnscentedKalmanFilter_GetXHat_Vi UnscentedKalmanFilter_GetXHat.vi UnscentedKalmanFilter_New_Default.vi UnscentedKalmanFilter_New_FuncGroup.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
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UNSCENTED KALMAN FILTE	X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	Exec	st	UnscentedKalmanFilter_Correct_FuncGroup.vi UnscentedKalmanFilter_Correct_OnlyUY.vi UnscentedKalmanFilter_Correct_OnlyUYR.vi UnscentedKalmanFilter_Correct.vi UnscentedKalmanFilter_GetP_Single.vi UnscentedKalmanFilter_GetP.vi UnscentedKalmanFilter_GetXHat_Single.vi UnscentedKalmanFilter_GetXHat.vi UnscentedKalmanFilter_DetXHat.vi UnscentedKalmanFilter_New_Default.vi UnscentedKalmanFilter_New_FuncGroup.vi UnscentedKalmanFilter_New.vi UnscentedKalmanFilter_Predict.vi UnscentedKalmanFilter_Predict.vi UnscentedKalmanFilter_Reset.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
UNSCENTED KALMAN FILTE	X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	Exec	st	UnscentedKalmanFilter_Correct_FuncGroup.vi UnscentedKalmanFilter_Correct_OnlyUY.vi UnscentedKalmanFilter_Correct_OnlyUYR.vi UnscentedKalmanFilter_Correct.vi UnscentedKalmanFilter_GetP_Single.vi UnscentedKalmanFilter_GetP.vi UnscentedKalmanFilter_GetXHat_Single.vi UnscentedKalmanFilter_GetXHat.vi UnscentedKalmanFilter_New_Default.vi UnscentedKalmanFilter_New_FuncGroup.vi UnscentedKalmanFilter_New.vi UnscentedKalmanFilter_Predict.vi UnscentedKalmanFilter_Predict.vi UnscentedKalmanFilter_Reset.vi UnscentedKalmanFilter_Reset.vi UnscentedKalmanFilter_SetP.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
UNSCENTED KALMAN FILTE	X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	Exec	st	UnscentedKalmanFilter_Correct_FuncGroup.vi UnscentedKalmanFilter_Correct_OnlyUY.vi UnscentedKalmanFilter_Correct_OnlyUYR.vi UnscentedKalmanFilter_Correct.vi UnscentedKalmanFilter_GetP_Single.vi UnscentedKalmanFilter_GetP.vi UnscentedKalmanFilter_GetXHat_Single.vi UnscentedKalmanFilter_GetXHat.vi UnscentedKalmanFilter_DetXHat.vi UnscentedKalmanFilter_New_Default.vi UnscentedKalmanFilter_New_FuncGroup.vi UnscentedKalmanFilter_New.vi UnscentedKalmanFilter_Predict.vi UnscentedKalmanFilter_Predict.vi UnscentedKalmanFilter_Reset.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking

Revision 3.X 1/11/2023 – renamed library. Added additional documentation. UnscentedKalmanFilter Transform.vi '======== STATE SPACE CONTROL '========= VI Name Function Prototype Notes CONTROL AFFINE PLANT INVERSION FEEDFORWARD ltem! Function Prototype VI Name Notes DIFFERENTIAL DRIVE ACCELERATION LIMITER X DiffDrvAccelLimit Calculate.vi X Χ X DiffDrvAccelLimit New.vi Function Prototype Notes IMPLICIT MODEL FOLLOWER X ImplModelFollow Calculate.vi \bar{X} Χ X ImplModelFollow_GetU.vi X X Χ X ImplModelFollow_GetU_Single.vi XX Χ Χ ImplModelFollow_New.vi X X Χ X ImplModelFollow_New_Plant.vi XX Χ ImplModelFollow Reset.vi X Function Prototype Notes LINEAR PLANT INVERSION FEEDFORWARD X LinearPIntInvFF_Calculate_NextR.vi X X X LinearPIntInvFF_Calculate.vi X Χ LinearPIntInvFF_GetR_Single.vi Χ Χ Χ X X LinearPIntInvFF GetR.vi Χ X X LinearPIntInvFF GetUff Single.vi X Χ Χ LinearPIntInvFF GetUff.vi X X LinearPIntInvFF New Plant.vi X Χ LinearPIntInvFF_New.vi X X Χ X Χ LinearPIntInvFF Reset Initial.vi Χ Χ Χ LinearPIntInvFF_Reset_Zero.vi

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		Documented Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
LINEAR QUADRATIC REGULATOR		X X	X			LinearQuadraticRegulator_Calculate_NextR.vi LinearQuadraticRegulator_Calculate.vi					
		X	X			LinearQuadraticRegulator_GetK_Single.vi		NOT ORIGINAL			
		X	X		Х	LinearQuadraticRegulator_GetK.vi					
	X	X	X			LinearQuadraticRegulator_GetR_Single.vi					
		X	X			LinearQuadraticRegulator_GetR.vi					
		X	X			LinearQuadraticRegulator_GetU_Single.vi					
		X X	X		X	LinearQuadraticRegulator_GetU.vi LinearQuadraticRegulator_LatencyCompensate.vi		Routine exists, but it only has			
	^ ′	^	^		^			nterger raise matrix to power.			
	X		X			LinearQuadraticRegulator_New_ELMS.vi		,			
	X	X	X			LinearQuadraticRegulator_New_N.vi					
	V .	~	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \			LinearQuadraticRegulator_New_Raw.vi					
	XXX	X	X		X	LinearQuadraticRegulator_New_SystemELMS.vi LinearQuadraticRegulator_New.vi					
		x	X			LinearQuadraticRegulator_Reset.vi					
	, ,		+ **								
	Implemented	Documented Not WPILIB	Menu Item	Execution Optimiz	Test Routine	Sample Program			Code Review	Test Program	or Checking
	du 6	Not Not	Mer	Xe	res	S VI Name	Function Prototype	Notes	00	<i>l</i> es	Error
LINEAR SYSTEM		$\frac{1}{X}$	\overline{X}	I		LinearSystem_CalculateX.vi					-
		X	X	1		LinearSystem_CalculateY.vi					
		X	X	SI		LinearSystem_GetA.vi					
		X	X	SI		LinearSystem_GetAElement.vi					
		X	X	SI		LinearSystem_GetB.vi					
		X X	X			LinearSystem_GetBElement.vi LinearSystem_GetC.vi					
		X	X	SI		LinearSystem GetCElement.vi					
		X	X	SI		LinearSystem GetD.vi					
	X		$\frac{1}{X}$	SI		LinearSystem_GetDElement.vi					
	X	X	X	SI		LinearSystem_New.vi					
	Implemented	Documented Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Director as	Nata	Code Review	Test Program	Error Checking
LINEAR SYSTEM LOOP		<u> </u>	<u>≥</u> X	Щ	1	VI Name LinearSystemLoop_ClampInput.vi	Function Prototype	Notes	O	<u> </u>	<u> </u>
LINLAN SISIEM LOOP	X	\hat{x}	X			Linear System Loop_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					
	XXX	^ ×	X			LinearSystemLoop_GetNextR_Single.vi LinearSystemLoop_GetNextR.vi					
	X	\hat{x}	X			LinearSystemLoop_GetObserver.vi					
	X		X			LinearSystemLoop_GetU_Row.vi					
	X	X	X			LinearSystemLoop_GetU.vi					
	X	X	X			LinearSystemLoop_GetXHat_Single.vi					

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Revision 3.X 1/11/2023 – renamed library. Added additional do	cume	ntation.		V			Linear Court and Lorent Control of the Control of t	T				
	<u> </u>	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			LinearSystemLoop_Predict.vi			+ + +		
	X			X			LinearSystemLoop_Reset.vi					
		4					LinearSystemLoop_SetClampFunction.vi					
							LinearSystemLoop_SetNextR_Some.vi					
	X	Χ		Χ			LinearSystemLoop_SetNextR.vi					
		<u> </u>					LinearSystemLoop_SetXHat_Single.vi					
							LinearSystemLoop_SetXHat.vi					
LTV DIFFERENTIAL DRIVE CONTROLLER	X X X	X			Execution Optimized Test Routine	Sample Program	VI Name LTVDiffDriveCtrl_Calculate.vi LTVDiffDriveCtrl_New.vi LTVDiffDriveCtrl_Calculate_TrajState.vi LTVDiffDriveCtrl_Calculate_SetTolerance.vi LTVDiffDriveCtrl_Calculate_AtReference.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
LTV UNICYCLE CONTROLLER	X X X	X X X X		X X X X X X X X X X X X X X X X X X X	X X X X Test Routine		VI Name LTVUnicycleCtrl_AtReference.vi LTVUnicycleCtrl_Calculate_TrajState.vi LTVUnicycleCtrl_Calculate.vi LTVUnicycleCtrl_New.vi LTVUnicycleCtrl_SetEnabled.vi LTVUnicycleCtrl_SetTolerance.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
STATE SPACE UTILITIES '=========												
CALLBACK HELPER		D 00 1	X X	X	Execution Optimized Test Routine		VI Name CallbackHelp_MatrixMinus.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	X	Χ.	X	X			CallbackHelp_MatrixMult_CoerceSizeB.vi					
	X	X .	X	X			CallbackHelp_MatrixMult.vi					
	X	Χ .	X	X		+	CallbackHelp_MatrixPlus.vi			+		

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mplemented	Documented	Vot WPILIB	Venu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
DISCRETIZATION X	X		X		X	Discretization_DiscretizeA.vi	71				
X	X		Χ		Χ	Discretization_DiscretizeAB.vi					
X	X		Χ		Χ	Discretization_DiscretizeABTaylor.vi					
X	X		Χ		X	Discretization_DiscretizeAQ.vi					
X	X		Χ		X	Discretization_DiscretizeAQTaylor.vi					
X	X		Χ			Discretization_DiscretizeR.vi					

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

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

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

Revision 3.X 1/11/2023 – renamed library. Added additional documentation.

Execution Optimized Function Prototype DIFFERENTIAL DRIVE TRAIN SIM $X \mid X$ DiffDriveTrainSim ClampInput.vi DiffDriveTrainSim CreateKitbotSim EstMass.vi X X X XX X DiffDriveTrainSim CreateKitbotSim EstMassMOI.vi XX Χ DiffDriveTrainSim CreateKitbotSim.vi XX Χ DiffDriveTrainSim GetCurrentDrawAmps.vi X X Χ DiffDriveTrainSim GetCurrentGearing.vi XX Χ DiffDriveTrainSim GetDynamics.vi XX X DiffDriveTrainSim GetHeading.vi XX X DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi Χ Χ DiffDriveTrainSim GetLeftPositionMeters.vi X DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi Χ Χ X Χ Χ Χ DiffDriveTrainSim_GetOutput_Single.vi X X X DiffDriveTrainSim GetPose.vi Χ X X DiffDriveTrainSim GetRightCurrentDrawAmps.vi Χ Χ DiffDriveTrainSim GetRightPositionMeters.vi X X X X DiffDriveTrainSim GetRightVelocityMetersPerSecond.vi X X Χ DiffDriveTrainSim GetState Single.vi XX Χ DiffDriveTrainSim GetState.vi XX Χ DiffDriveTrainSim KitBotWheelSize.vi XX Χ DiffDriveTrainSim New Mass MOI.vi X X Χ DiffDriveTrainSim New.vi $X \mid X$ Χ DiffDriveTrainSim SetCurrentGearing.vi XX DiffDriveTrainSim SetInputs.vi X XX DiffDriveTrainSim SetPose.vi X Χ Χ X DiffDriveTrainSim SetState.vi Χ X Χ DiffDriveTrainSim_ToughBoxMiniGearRatio.vi Χ DiffDriveTrainSim_ToughBoxMiniMotor.vi Χ X DiffDriveTrainSim Update.vi X Χ X Optin Function Prototype Notes ElevatorSim_GetCurrentDraw.vi ELEVATOR SIM X ElevatorSim GetPositionMeters.vi X X X XX X ElevatorSim GetVelocityMetersPerSecond.vi XX Χ ElevatorSim HasHitLowerLimit.vi XX X ElevatorSim HasHitUpperLimit.vi ElevatorSim_New_LinSys_NoNoise.vi ElevatorSim_New_LinSys.vi ElevatorSim New NoNoise.vi Χ Χ Χ ElevatorSim New.vi X No X Χ ElevatorSim RKF45 Func.vi Χ Χ X ElevatorSim_SetInputVoltage.vi X ElevatorSim SetState.vi X X XX ElevatorSim Update.vi X Needed because this doesn't extend. ElevatorSim UpdateX.vi Χ X X Χ ElevatorSim WouldHitLowerLimit.vi X X X X X ElevatorSim WouldHitUpperLimit.vi

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WPILib LabVIEW Math Library – VI Implementation List Revision 3.X 1/11/2023 – renamed library. Added additional documentation. Execution Optir Routine Function Prototype Notes FLYWHEEL SIM X FlyWheelSim_GetAngularVelocityRadPerSec.vi X X FlyWheelSim_GetAngularVelocityRPM.vi Χ X Χ X X X FlyWheelSim GetCurrentDrawAmps FlyWheelSim_New_LinSys Future FlyWheelSim_New_LinSys_MOI_NoNoise Future FlyWheelSim New LinSys NoNoise Future X X Χ FlyWheelSim_New_MOI.vi XX X FlyWheelSim SetInput.vi XX Χ FlyWheelSim SetState.vi XX Χ FlyWheelSim Update.vi VI Name Function Prototype Notes LINEAR SYSTEM SIM X X LinearSystemSim_ClampInput.vi X LinearSystemSim_GetCurrentDrawAmps.vi DONT IMPLEMENT... LinearSystemSim_GetOutput_Single.vi Χ X X Χ LinearSystemSim_GetOutput.vi Χ Χ X X X LinearSystemSim New LinearSystemSim_New_NoNoise.vi Χ X LinearSystemSim SetInput Array.vi Doesn't use clamp? Χ LinearSystemSim_SetInput_Single.vi Χ Χ X X Χ LinearSystemSim_SetInput.vi X X Χ LinearSystemSim Setstate.vi XX Χ LinearSystemSim_Update.vi XX No LinearSystemSim UpdateX.vi X X X No LinearSystemSim_UpdateY.vi Wenu Item Function Prototype Notes SINGLE JOINT ARM SIM X Χ SngJntArmSim EsitmateMOI.vi SngJntArmSim_GetAngleRads.vi XX X X X SngJntArmSim GetCurrentDraw.vi Χ XX SngJntArmSim_GetVelocityRadsPerSec.vi Χ X X X SngJntArmSim_HasHitLowerLimit.vi Χ SngJntArmSim_HasHitUpperLimit.vi Χ Χ Χ Χ Χ SngJntArmSim New.vi

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SngJntArmSim Rkf45 Func.vi

SngJntArmSim SetState.vi

SngJntArmSim_UpdateX.vi

SngJntArmSim_Update.vi

SngJntArmSim SetInputVoltage.vi

SngJntArmSim_WouldHitLowerLimit.vi

SngJntArmSim_WouldHitUpperLimit.vi

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Revision 3.X 1/11/2023 – renamed library. Added additional documentation.

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Function Prototype Notes MAT BUILDER X X X SI MatBuilder Create.vi X X X SI MatBuilder Fill.vi Function Prototype Notes MATRIX XX X SI Matrix_AssignBlock.vi XX X SI Matrix Block.vi Matrix ChangeBoundsUnchecked.vi XX X SI Matrix Create.vi Matrix Det.vi XX Matrix_Diag.vi X SI Matrix_Div_Scalar.vi labview has function Matrix ElementPower.vi XX X SI Matrix ElementSum.vi Matrix ElementTimes.vi Matrix_Equals.vi XX XI Matrix_Exp.vi X X X SI Matrix ExtractColumnVector.vi XX X SI Matrix ExtractFrom.vi Matrix ExtractMatrix.vi XX Matrix ExtractRowVector.vi X SI Matrix_Fill.vi X X X SI Matrix Get.vi labview has function XX X Matrix Ident.vi WPILIB calls this EYE Matrix Inv.vi X X X SI Matrix IsEqual.vi Matrix_IsIdentical.vi XX XI Matrix_LLTDecompose.vi Matrix Max.vi Matrix MaxAbs.vi Matrix Mean.vi Matrix MinInternal.vi Matrix Minus Matrix.vi Matrix_Minus_Scalar.vi XX Matrix NormF.vi Matrix NormIndP1.vi Matrix Plus Matrix.vi Matrix Plus Scalar.vi XX XI Matrix Pow.vi THIS NEEDS WORK!!!! XX X SI Matrix SetColumn.vi 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 XX X SI Matrix Transpose.vi Matrix WithinTolerance.vi $X \mid X \mid X \mid X$

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WPILib LabVIEW Math Library – VI Implementation List Revision 3.X 1/11/2023 – renamed library. Added additional documentation. VI Name Function Prototype Notes SIMPLE MATRIX X NOTE Matrix also has an SimpleMatrix ExtractMatrix.vi ExtractMatrix with different calling parameters.... YUK. Function Prototype VI Name Notes MATRIX HELPER X X X X SI MatrixHelper CooerceSize.vi MatrixHelper_MultCooerceBSize.vi MatrixHelper_Zero.vi VI Name Function Prototype Notes VecBuilder_1x1Fill.vi VecBuilder_2x1Fill.vi VecBuilder_3x1Fill.vi VECTOR BUILDER X X SI Χ X X X X X X X X X X X | X | SI | X | SI | X | SI | VecBuilder 4x1Fill.vi X SI VecBuilder_5x1Fill.vi X X X SI VecBuilder_6x1Fill.vi XX X SI VecBuilder 7x1Fill.vi XX X SI VecBuilder_8x1Fill.vi VecBuilder 9x1Fill.vi VecBuilder_10x1Fill.vi X X X X SI VecBuilder_ArrayBy1Fill.vi Function Prototype VI Name Notes VECTOR X Vector_Dot.vi Χ Χ SI

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MATH	
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X Si

Χ Χ Vector_Norm.vi

FRC_LabVIEW_Trajectory_Library_Routines.xlsx Page 34 / 39 WPILib LabVIEW Math Library – VI Implementation List Revision 3.X 1/11/2023 – renamed library. Added additional documentation. Function Prototype Notes ANGLE STATISTICS X X X X AngleStats_AngleAdd_CallbackHelp.vi
AngleStats_AngleAdd.vi AngleStats AngleMean CallbackHelp.vi XX X I X AngleStats_AngleMean.vi X X X X X AngleStats_AngleResidual_CallbackHelp.vi X X X I X AngleStats AngleResidual.vi VI Name Function Prototype Notes MATH UTILITY X X X SI MathUtil AngleModulus.vi XX X SI MathUtil ApplyDeadband.vi XX MathUtil_Clamp_Int.vi X SI X X MathUtil Clamp.vi X SI XX MathUtil_InputModulus.vi X SI XX MathUtil Interpolate.vi X Si Menu Item VI Name Function Prototype Notes MERWE SCALED SIGMA POINTS X Χ X MerweScSigPts_ComputeWeights.vi Χ X X SI MerweScSigPts_GetNumSigmas.vi X X X X SI MerweScSigPts_GetWc_Single.vi Χ X MerweScSigPts GetWc.vi X SI MerweScSigPts GetWm Single.vi Χ X X X SI MerweScSigPts_GetWm.vi X X X I MerweScSigPts_New_Default.vi XX XI MerweScSigPts_New.vi XX XI MerweScSigPts_SigmaPoints.vi

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optin	Test Routine	Sample Prograr	Function Prototype	Notes	Code Review	Test Program	Error Checking
NUMERICAL INTEGRATION	X	X		X	1		NumIntegrate_Func_Ax_Bu_K.vi		NOT USED. Should this be used or abandoned???			
	Χ	X		X			NumIntegrate_Rk4_Dbl_X_U.vi					
	Χ	X		X			NumIntegrate_Rk4_Dbl_X.vi					
	Χ	X		X			NumIntegrate_Rk4_Mat_X_U.vi					
	Χ	X		X			NumIntegrate_Rk4_Mat_X.vi					
	Χ	X		No	SI		NumIntegrate_Rkdp_Func_A.vi					
	Χ	X		No	SI		NumIntegrate_Rkdp_Func_B1.vi					
	X	X		No	SI		NumIntegrate_Rkdp_Func_B1B2.vi					
	Χ	Χ		No	SI		NumIntegrate_Rkdp_Func_B2.vi					
	Χ	Χ		No	I		Numintegrate_Rkdp_Impl.vi					

WPILib LabVIEW Math Library – VI Implementation List Revision 3.X 1/11/2023 – renamed library. Added additional documentation. NumIntegrate RKDP Mat X U.vi New replacement for RKF45 XX No SI NumIntegrate Rkf45 Func A.vi XX No SI NumIntegrate_Rkf45_Func_B1.vi XX No SI NumIntegrate Rkf45 Func B1B2.vi NumIntegrate Rkf45 Func B2.vi $X \mid X$ No SI NumIntegrate RKf45 Func Bs.vi Removed. Replaced with newer NumIntegrate_RKf45_Func_Ch.vi Removed. Replaced with newer functions. NumIntegrate_RKf45_Func_Ct.vi Removed. Replaced with newer functions. X X No I NumIntegrate_Rkf45_Impl.vi NumIntegrate_Rkf45_Mat_X_U.vi XX X Note that this Feinberg method has been changed and a Dormand Price method has been implemented....TODO NumIntegrate_RKf45_New.vi Removed. Never used X X X X SI X X X X X I NumIntegrate Trap Dbl.vi NumIntegrate_Trap_Mat.vi Menu Item VI Name Function Prototype Notes RUNGE KUTTA TIME VARYING X X RungeKuttaTimeVarying RK4 Mat T Y.vi No ltem VI Name Function Prototype Notes NUMERICAL JACOBIAN X X X NumJacobian U.vi XX Χ NumJacobian X.vi Execution Optimized Menu Item Function Prototype Notes RICCATI X X X Riccati Check Detectable.vi Routine exists, it is just a shell Riccati Check Stabilizable.vi XX Χ Not really done !!! Riccati DARE Choose.vi Intended to allow DARE method X X X X Riccati DARE Iterate.vi X Riccati_DARE_StructDoubling.vi X X X X Χ XX X Riccati_DARE_N.vi X X Χ Χ Riccati DARE.vi

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Riccati_Input_Check.vi

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· renamed library. Added additional d	ocumei	ntatior	١.									
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
COMPUTER VISION UTILITIES	X	X		X			CompVisionUtil_CalculateDistanceToTarget.vi					
	X	Χ		Χ			CompVisionUtil_EstimateCameraToTarget.vi					
	X	Χ		Χ			CompVisionUtil_EstimateFieldToCamera.vi					
	X	Χ		Χ			CompVisionUtil_EstimateFieldToRobot.vi					
	X	Χ		Χ			CompVisionUtil_EstimateFieldToRobot_Alt.vi					

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

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimiz	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TypeDef	Ζ	Ζ	Χ	Χ	N/A			ARM FF.CTL		
	Ζ	Ζ	Χ	Χ	N/A			BANG_BANG.CTL		
	١		X	X	N/A			BICon-Matrix_FUNC_TYPE.CTL		NOT USED. Should this be deleted or abandoned???
	Ζ	Ζ	X	X	N/A			CALLBACK_FUNC_TYPE.CTL		
	Ζ	Ζ	Χ	Χ	N/A			CHASSIS_SPEEDS.CTL		
	Ζ	Ζ	Χ	Χ	N/A			CONTRAINED_STATE.CTL		
	Ζ	Ζ	Χ	Χ	N/A			COORDINATE_AXIS.CTL		
	Ζ	Z	X	Χ	N/A			COORDINATE_SYSTEM.CTL		
	Ζ	Ζ	Χ	Χ	N/A			DCMOTOR_TYPES_ENUM.CTL		
	Ζ	Ζ	Χ	Χ	N/A			DCMOTOR.CTL		
	Ζ	Ζ	Χ	Χ	N/A			DCMOTOR_SIM.CTL		
	Ζ	Ζ	Χ	Χ	N/A			DEBOUNCER_TYPE_ENUM.Ctl		
	Ζ	Ζ	Χ	Χ	N/A			DEBOUNCER.CTL		
	Ζ	Ζ	Χ	X	N/A			DIFF_DRIVE_ACCEL_LIMIT.CTL		
	Ζ	Ζ	Χ	X	N/A			DIFF_DRIVE_KINEMATICS.CTL		
	Ζ	Ζ	Χ	X	N/A			DIFF_DRIVE_Kitbot_WheelSize_ENUM.ctl		
	Ζ	Ζ	Χ	X	N/A			DiFF_DRIVE_Pose_EST.ctl		
	Ζ	Ζ	Χ	X	N/A			DIFF_DRIVE_ToughBoxMini_GearChoice_ENUM.ctl		
	Ζ	Ζ	Χ	X	N/A			DIFF_DRIVE_ToughBoxMini_MotorChoice_ENUM.ctl		
	Ζ	Ζ	Χ	X	N/A			DIFF_DRIVE_TRAIN_SIM_STATE_ENUM.CTL		
	Ζ	Ζ	Χ	X	N/A			DIFF_DRIVE_TRAIN_SIM.ctl		
	Ζ	Ζ	Χ	X	NA			DISPLAY_WAYPOINT.ctl		Was UTIL_WAYPOINT.VI

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al documer	ntation	١.				
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	Ζ	X	X	N/A	EXTENDED_KALMAN_CORRECT_FUNC_GROUP.CTL	
Z		Χ	X	N/A	EXTENDED_KALMAN_FILTER.CTL	
Z	Z	X	X	N/A	FLYWHEEL_SIM.ctl	
Z	Ζ	X	X	N/A	FUNCTION_GENERATOR.cti	
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		X	X	N/A N/A	TIME_INTERPOLATABLE_DOUBLE.CTL TIME_INTERPOLATABLE_POSE2D.CTL	
Z	Z	X	X	N/A	TIME_INTERPOLATABLE_POSEZD.CTL 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	Χ	X	N/A	LINEAR_FILTER.CTL	
Z	Ζ	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 LTV DIFF DRIVE CTRL.ctl	
Z	Z Z	X	X	N/A N/A	LTV_DIFF_DRIVE_CTRL.cti LTV DIFF DRIVE CTRL STATE ENUM.ctl	
Z	Z	X	X	N/A N/A	LTV_DIFF_DRIVE_CTRL_STATE_ENOM.CII LTV UNICYCLE CONTROLLER.CTL	
N/A		N/A	^	N/A	LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl	OBSOLETE – Removed
Z	Z	X	Х	N/A	LTV UNICYCLE CONTROLLER STATE ENUM.ctl	OBCCETE - Removed
Z	Z	X	X	N/A	MECA DRIVE KINEMATICS.CTL	
Z	Ζ	X	X	N/A	MECA_DRIVE_ODOMETRY.CTL	
Z	Ζ	Χ	Χ	N/A	MECA_DRIVE_POSE_EST.CTL	
Z	Z	X	X	N/A	MECA_WHEEL_POSITIONS.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 N/A	MERWE_SCALED_SIGMA_PTS.ctl OBSERVER_SNAP_LIST_ITEM.CTL	
Z		X	X	N/A N/A	OBSERVER_SNAPSHOT.CTL 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	Χ	X	N/A	PID_ADV_TUNING.CTL	
Z	Ζ	Χ	X	N/A	PID_CONTROLLER.CTL	
Z	Ζ	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 N/A	POSE2D.CTL POSE3D.CTL	
Z	Z Z	X	X	N/A N/A	POSESD.CTL 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	Ζ	Χ	Χ	N/A	RAMSETE.CTL RAMSETE.CTL	
Z	Ζ	Χ	Χ	N/A	ROTATION2D.CTL	
Z	Ζ	X	Χ	N/A	ROTATION3D.CTL	
Z	Z	X	Χ	N/A	SIMPLE_MOTOR_FF.CTL	
Z	Z	X	V	N/A	SIMPLE_MOTOR_FF_KA_TUNE_PARAMS.CTL	
Z	Z	X	X	N/A N/A	SINGLE_JOINT_ARM_SIM.CTL SLEW RATE LIMITER.CTL	
Z	Z	X	X	N/A N/A	SLEW_RATE_LIMITER.CTL SPLINE CTRL VECTOR.CTL	
Z	Z	X	X	N/A N/A	SPLINE_CTRL_VECTOR.CTL SPLINE.CTL	
Z	Z	X	X	N/A	SWERVE DRIVE KINEMATICS.CTL	
Z	Z	X	X	N/A	SWERVE DRIVE MODULE POSITION.CTL	
Z	Z	X	X	N/A	SWERVE_DRIVE_MODULE_STATE.CTL	
Z	Ζ	X	Χ	N/A	SWERVE_DRIVE_ODOMETRY.CTL	
Z	Ζ	X	Χ	N/A	SWERVE_DRIVE_Pose_EST.CTL	
Z	Z	X	X	N/A	TIMER.CTL	

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ocumei	ntation	١.					
Z	Ζ	Χ	Χ	N/A		TRAJ CONFIG.CTL	
Z	Ζ	X	Χ	N/A	1	TRAJ CONSTRAINT CENTRIPETAL ACCEL.CTL	
Z	Ζ	X	Χ	N/A	1	TRAJ_CONSTRAINT_DIIF_DRIVE_KINEMATICS.CTL	
Z	Ζ	X	Χ	N/A		TRAJ CONSTRAINT DIIF DRIVE VOLTAGE.CTL	
Z	Ζ	X	Χ	N/A	1	TRAJ CONSTRAINT ELLIP REGION.CTL	
1		X		N/A	1	TRAJ CONSTRAINT JERK.CTL	Routine exists, it is just a shell
Z	Ζ	X	Χ	N/A		TRAJ_CONSTRAINT_MAX_VELOCITY.CTL	•
Z	Ζ	X	Χ	N/A	1	TRAJ_CONSTRAINT_MECA_DRIVE_KINEMATICS.CTL	
Z	Z	X	X	N/A	1	TRAJ_CONSTRAINT_MINMAX.CTL	
Z	Z	X	Χ	N/A	1	TRAJ_CONSTRAINT_RECT_REGION.CTL	
Z	Ζ	X	Χ	N/A	1	TRAJ_CONSTRAINT_SWERVE_DRIVE_KINEMATICS.CTL	
Z	Ζ	X	Χ	N/A	1	TRAJ_STATE.CTL	
Z	Ζ	X	Χ	N/A	7	TRAJECTORY_SPLINE_TYPE_ENUM.CTL	
Z	Ζ	X	Χ	N/A	7	TRAJECTORY.CTL	
Z	Ζ	X	Χ	N/A	7	TRANSFORM2D.CTL	
Z	Ζ	X	Χ	N/A	7	TRANSFORM3D.CTL	
Z	Ζ	X	Χ	N/A		TRANSLATION2D.CTL	
Z	Ζ	X	X	N/A		TRANSLATION3D.CTL	
Z	Ζ	X	X	N/A		TRAPEZOID_PROFILE_CONSTRAINT.CTL	
Z	Ζ	X	X	N/A		TRAPEZOID_PROFILE_STATE.CTL	
Z	Ζ	X	Χ	N/A		TRAPEZOID_PROFILE.CTL	
Z	Ζ	X	Χ	N/A	7	TWIST2D.CTL	
Z	Ζ	X	Χ	N/A		TWIST3D.CTL	
Z	Ζ	Χ	X	N/A	l l	UNSCENTED_KALMAN_CORRECT_FUNC_GROUP.CTL	
Z	Ζ	X	Χ	N/A	L	UNSCENTED_KALMAN_FILTER.ctl	
Z	Ζ	X	Χ	N/A	L	UNSCENTED_KALMAN_NEW_FUNC_GROUP.CTL	
Ζ	Ζ	Χ	Χ	N/A	L	JTIL_PATHFINDER_CONFIG.CTL	
N/A		N/A		N/A	V	WAYPOINTS.CTL	Delete – obsolete
Z	Ζ	Χ	Χ	NA	V	WEIGHTED_WAYPOINT.CTL	New V1.5
N/A		N/A		N/A	>	X_Y_HEADINGS.CTL	Delete – obsolete
Ζ	Ζ	Χ	X	N/A	>	X_Y_PAIR.CTL	

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