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 (Z)
VI Shell Total (I)
CTRL Shell Total (I)

Doc completed Pct 99.27% Optimization Pct 56.54%

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

'======== BASE

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

ous routines							
	X X X X SI	FunctionGenerator_New.vi		Similar to interpolated tree map			
LEAD LAG		VI Name LeadLag Execute.vi	Function Prototype	Notes Similar to interpolated tree map	Code Review	Test Program	Error Checking
	7, 7, 7,			James to morporated troe maps	l	I	
LINEAR FILTEI		We will be set to the set of the	Function Prototype	Notes	Code Review	Test Program	Error Checking
	X X X SI	LinearFilter_Calculate.vi					
	X X X X X X X X X X X X X X X X X X X	LinearFilter_CutoffFrequency.vi X LinearFilter_Execute.vi LinearFilter_Factorial.vi LinearFilter_FiniteDifference.vi LinearFilter_HighPass.vi		Labview style helper AN INTERNAL ROUTINE			
	X X X X X	LinearFilter_HighPassBW1.vi					
	X X X X X	LinearFilter_HighPassBW2.vi					
		LinearFilter_LowPassBW1.vi					
	X X X X X	LinearFilter_LowPassBW2.vi					
	X X X X	LinearFilter_MovingAverage.vi					
	X X X I	LinearFilter_New.vi LinearFilter Reset.vi					
	X X X SI	LinearFilter_Reset.vi LinearFilter ResetToValue.vi					
		LinearFilter_Reset i ovalue.vi LinearFilter_SinglePoleIIR.vi					
	X X X X X X X X X X	LinearFilter TimeConst.vi					
MEDIAN FILTEI		WedianFilter_ResetToValue.vi	Function Prototype	Notes Labview style helper	Code Review	Test Program	Error Checking
SLEW RATE FILTE		VI Name SlewRateLimiter_Calculate.vi SlewRateLimiter_Close.vi X SlewRateLimiter_Execute.vi SlewRateLimiter_GetRate.vi SlewRateLimiter_New.vi SlewRateLimiter_NewInitialZero.vi SlewRateLimiter_Reset.vi SlewRateLimiter_Reset.vi SlewRateLimiter_SetRate.vi	Function Prototype	Notes Labview style helper	Code Review	Test Program	Error Checking

022 – added various routines												
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	Implemented	Documentec	Not WPILIB	กน	Execution	Test Routine	ରୁ Name ଜୁନ			Code Rev	Test Program	
			8	Menu		ě		Function Prototype	Notes	ပိ	, Je	Error
TIMER	X		X	X			Timer_Close.vi		releases semaphore			
	X	X		X			X Timer_Get.vi					
	Χ		X	X			Timer_GetAndReset.vi			ļ!		
	X	X	X				Timer_GetInternal.vi		Internal (private) only	<u> </u>		
	X	X		X			X Timer_HasPeriodPassed.vi			!		
	X		X				X Timer_HasPeriodPassedOnce.vi			<u> </u>		
	X	X	+	X			X Timer_New.vi					
	X	X	X	X No			X Timer_Reset.vi Timer ResetInternal		Internal (private) only			
	X	X		X		_	X Timer_Start.vi		internal (private) only			
	X	X		$\frac{\lambda}{X}$			X Timer_Stop.vi					
	\overline{X}	X	X				Timer_StopInternal.vi		Internal (private) only			
				710			Timor_otopiniomal.vi		internal (private) only			
					þe	5						
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	75	_			Optin		grai			>	æ	ing
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	nplementec	Documente	Not WPILIB	Menu Item	Execution	Test Routine	ର			Code Rev	Test Program	
	1	00			Ě	ě		Function Prototype	Notes	ပိ	Je Je	Error
TIME INTERPOLATABLE BOOLEAN		X	X	X	1		TimeInterpBoolean_AddSample.vi		Update to use create matrix			
	X	X	X	No	1		TimeInterpBoolean_CleanUp.vi		Update to use create matrix			
	X			X	S	1	TimeInterpBoolean_Clear.vi			<u> </u>		
	X	X	X	X	1		TimeInterpBoolean_GetSample.vi			<u> </u>		
	X	X	X	$\frac{X}{X}$	S		TimeInterpBoolean_New.vi TimeInterpBoolean_SetMaxTime.vi			<u> </u>		
	^_		^	^	3	,	Timemerpboolean_SetiviaxTime.vi					
					ğ	5						
					Execution Optimized	ĺ	2					
	_	_			otin	_	ıram.			>	2	ng
	tec	tea	18	2	Õ	Test Routine	Progr			je.	Test Program	Checking
	Jen	ien	7/6	ten	io	ont	Φ.			Şe	0 Q	;he
	plementec	Documente	Not WPILIB	Menu Item	Th's	# T	R VI Name			ě	<i>t</i>	
	ш	õ	Vot	<i>Jet</i>	e Xi	ies ies	S VI Name	Function Prototype	Notes	Ö	မွ	Error
TIME INTERPOLATABLE DOUBLE	X			\overline{X}			TimeInterpDouble_AddSample.vi	- another recoypt	Update to use create matrix			7
	X		X	No			TimeInterpDouble_CleanUp.vi		Update to use create matrix			
	Χ	X	X	X	S	1	TimeInterpDouble_Clear.vi		·	1		
	Χ	Χ	X	X	1		TimeInterpDouble_GetSample.vi					
	X	X	X	X	S	1	TimeInterpDouble_New.vi			<u> </u>		
	X	X	X	X	S	<i>I</i>	TimeInterpDouble_SetMaxTime.vi			<u></u> '		
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	em	Ĕ	WF	u It	üţi	8	p)d			Œ o	Ţ	
	Jdu	Documente	Not WPILI	Menu	Execution	Test Routine	S Ample NI Name	Function Prototype	Notes	Code	Test	Error
TIME INTERPOLATABLE POSE2D	X		<u>≥</u>				7) VI Name TimeInterpPose2d_AddSample.vi	ι αποποιτητοιοιγρο	Update to use create matrix			
TIME INTERN CLATABLE FOSEZO	X			No	1		TimeInterpPose2d_Addoannpie.vi TimeInterpPose2d_CleanUp.vi		Update to use create matrix			
	X		X	X	S	,	TimeInterprose2d_Clear.vi		opado to doo orodio matrix			
	X			$+ \dot{x}$	1		TimeInterpPose2d_GetSample.vi					
	Χ	Χ	Χ	X	S	I	TimeInterpPose2d_New.vi					
	X	X	X	X	S	1	TimeInterpPose2d_SetMaxTime.vi					

FRC LabVIEW Trajectory Library - VI Implementation List Revision 2.X 11/06/2022 – added various routines Function Prototype TIME INTERPOLATABLE ROTATION2D $\begin{array}{c|cccc} \hline X & X \\ \hline \end{array}$ TimeInterpRotation2d AddSample.vi Update to use create matrix Χ X No TimeInterpRotation2d_CleanUp.vi Update to use create matrix X X SI TimeInterpRotation2d_Clear.vi X X X X I TimeInterpRotation2d_GetSample.vi TimeInterpRotation2d_New.vi
TimeInterpRotation2d_SetMaxTime.vi X X X X SI X X X X SI Function Prototype VI Name Notes WAIT ADJUST X WaitAdjust.vi Function Prototype Notes DIGITAL SEQUENTIAL LOGIC X DigSeqLogic_Delay.vi X X XX DigSeqLogic_On_Delay.vi DigSeqLogic_Off_Delay.vi DigSeqLogic_One_Shot.vi
DigSeqLogic_SR_Flip_Flop.vi Function Prototype Notes DEBOUNCER $\begin{array}{c|c} X & X \\ \hline X & X \end{array}$ X Debouncer New.vi Debouncer Calculate.vi X X X X Debouncer Execute.vi

'========
CONTROLLER
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ARM FF X X X X X A X A ArmFF_Calculate.vi LabVIEW style single call

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No

No

Debouncer_Reset.vi
Debouncer HasElapsed.vi

ous routines												
			X				ArmFF_ExecuteVelocityOnly.vi		LabVIEW style single call			
	X			X			ArmFF_MaxAchieveAccel.vi					
	Χ			X			ArmFF_MaxAchieveVelocity.vi					
	Χ	X		X			ArmFF_MinAchieveAccel.vi					
	Χ	X		X			ArmFF_MinAchieveVelocity.vi					
	Χ	X		X			ArmFF_New_ZeroGravity.vi					
	Χ	X		X			ArmFF_New.vi					
BANG BANG	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	19 19 19 19 19 19 19 19	DESTRUCTION OF THE PROPERTY OF	VI Name BangBang_AtSetpoint.vi BangBang_Calculate_PV.vi BangBang_Calculate_SP_PV.vi BangBang_Execute.vi BangBang_GetAll.vi BangBang_GetError.vi BangBang_New.vi BangBang_SetSetpoint.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	Χ	X		X	SI		BangBang_SetTolerance.vi					
CONTROLLER UTIL	X Implemented	X Documented	Not WPILIB	X Menu Item	© Execution Optimized		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	פאן אסמוווש	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
ELEV FF	_ <u>=</u> _	X	_ <	X	<u> </u>	` 	ElevFF_Calculate.vi	r unction Prototype	Notes			Щ
	X	X		$\frac{x}{x}$			ElevFF CalculateVelocityOnly.vi					
			X	+ ^ +		+	ElevFF_Execute.vi		LabVIEW style single call			
			X	+ +		+	ElevFF_ExecuteVelocityOnly.vi		LabVIEW style single call			
	Χ	X		X			ElevFF MaxAchieveAccel.vi					
	X	X		X			ElevFF MaxAchieveVelocity.vi					
	X	X		X			ElevFF_MinAchieveAccel.vi					
	Χ	X		X			ElevFF_MinAchieveVelocity.vi					
	X	X		X			ElevFF_New_ZeroAccel.vi					
	X	X		X	timized		ElevFF_New.vi					б
	Implemented	Documented	Not WPILIB	Menu Item	Execution Opt	ן פאן אסמווויפ	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
HOL_DRV_CTRL				X			HolDrvCtrl_AdvCalculate_Trajectory.vi		Added 1/24/2022			
	X	X	X	X			HolDrvCtrl_AdvCalculate.vi		Added 1/24/2022			
	X	X		X	SI		HolDrvCtrl_AtReference.vi		Added 1/26/21			
	X X X	Χ		X X X	1		HolDrvCtrl_Calculate_Trajectory.vi HolDrvCtrl_Calculate.vi HolDrvCtrl_Execute_Trajectory.vi		Added 1/26/21 Added 1/26/21 Added 1/24/2022			
Ļ	^	_ ^	_ ^	_ ^			TOID TYOUI_EXECUTE_TTAJECTORY.VI		7412022			

outines											
	X	Χ	Χ	X			HolDrvCtrl_Execute.vi		Future		
	X	X		X	SI		HolDrvCtrl New.vi		Added 1/26/21		
	X	Χ	Χ	Χ	SI		HolDrvCtrl PackExecuteSP.vi				
	X	X	X	X	<u> </u>		HolDrvCtrl PackPID.vi		Added 1/24/2022		
		^									
	Χ	Χ	Χ	Χ			HolDrvCtrl_PackProfPID.vi		Added 1/24/2022		
	X	Χ		X	SI		HolDrvCtrl_SetEnabled.vi		Added 1/26/21		
	X	X		X	SI		HolDrvCtrl SetTolerance.vi		Added 1/26/21		
					σ						
PID AUTOTUNE	X Implemented	Documented	X Not WPILIB	S Menu Item	Execution Optimize	Test Routine Sample Program	VI Name PIDAutoTune_ClosedLoopStep.vi	Function Prototype	Notes	Code Review Test Program	Error Checking
	X		Χ	No			PIDAutoTune_Convert_Academic_To_NonInteracting.vi				
	X		Χ	No			PIDAutoTune_OpenLoopStep.vi				
	X		Χ	X			PIDAutoTune SetTuningArguments.vi				
	X		X	X			PIDAutoTune Step.vi				
				,			127 tato 1 ano_otop.vi				
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimizea	Test Routine Sample Program	VI Name	Function Prototype	Notes	Code Review Test Program	Error Checking
PID CONTROLLER		\overline{X}	\overline{x}	\overline{x}	_		PIDController AdvCalculate FF Sp Pv Per.vi		Advanced PID		
TID GOMMOLLEN	X	X	X	X		X	PIDController_AdvCalculate_FF_Sp_Pv.vi PIDController_AdvExecute.vi		Advanced PID Labview style helper. Advanced PID		
	X	Χ		X	SI		PIDController AtSetpoint.vi				
		X		X			PIDController Calculate PV.vi				
	X										
	X	Χ		Χ			PIDController_Calculate_SP_PV.vi				
	X	Χ		X	SI		PIDController_DisableContinousInput.vi				
	X	Χ		Χ	SI		PIDController EnableContinousInput.vi				
	X	X	Χ	X		Y	PIDController Execute.vi		Labview style helper		
	^	^	^	^		Х	PIDController GetContinuousError.vi		OBSOLETE – Removed		
									OBSOLETE - Removed		
	X	Χ		X	SI		PIDController_GetPeriod.vi				
	X	X		X	SI		PIDController GetPID.vi				
	X	Χ		Χ	SI		PIDController GetPositionError.vi				
	X	X		X	SI		PIDController GetSetpoint.vi				
	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	^		^							
	X	X			SI		PIDController_GetTolerance.vi				
	Χ	Χ		Χ	SI		PIDController_GetVelocityError.vi				
	X	Χ		Χ	SI		PIDController_IsContinuousInputEnabled.vi				
	X	Χ		Χ	1		PIDController New.vi				
	X	Χ		X	1		PIDController NewPeriod.vi				
	X	X	X	\hat{x}	SI		PIDController Pack AdvLimits.vi				
	X	Χ		Χ	SI		PIDController_Pack_AdvTuning.vi				
	X	Χ		Χ	SI		PIDController_Pack_ErrorTolerance.vi				
	X	Χ	Χ	Χ	SI		PIDController_Pack_InputLimits.vi				
	X	Χ		X	SI		PIDController_Pack_Tuning.vi				
	X	X		X	SI		PIDController Reset.vi				
		X					PIDController SetD.vi				
	X		.,	X	SI				1818		
	X	Χ		Χ	SI		PIDController_SetDerivativeFilter.vi		Advanced PID		
	X	Χ	X	No			PIDController_SetFeedForward_OBSOLETE_DELETE.vi		Advanced PID, Obsolete – DELETE		
	X	Χ	Х	No			PIDController_SetFFGain_OBSOLETE_DELETE.vi		Advanced PID, Obsolete – DELETE		
	X	Y		Х	ÇI.		PIDController Setl.vi				
	^	^		^	IJΙ				ODDOLETE D		
							PIDController_SetInputRange.vi		OBSOLETE – Removed		
	1 1/	\ <u>/</u>		X	SI		PIDController_SetIntegratorRange.vi				
	X	Χ	!								
	X		X						Advanced PID		
	X	Χ	X	Χ	SI		PIDController_SetOutputLimits.vi		Advanced PID		
	X	X		X X	SI SI		PIDController_SetOutputLimits.vi PIDController_SetP.vi		Advanced PID		
	X	Χ		Χ	SI		PIDController_SetOutputLimits.vi		Advanced PID		

Ided various routines							-				
	X	(X	X	SI		PIDController_SetPIDF.vi		Advanced PID			
	X	(X	SI		PIDController_SetSetpoint.vi					
	X		X	SI		PIDController_SetTolerance.vi					
	X	(X	SI		PIDController_SetTolerancePandV.vi					
PROFILED PID CONTROLLER	Implemented	Not WPILIB	n Item	9 9 Execution Optimized	Test Routine	ram	Function Prototype	Notes	Code Review	Test Program	Error Checking
	X		$\frac{\lambda}{X}$			ProfiledPIDController DisableContInput.vi					
	$\begin{array}{c c} X & Z \\ \hline X & Z \end{array}$		$\frac{\lambda}{X}$			ProfiledPIDController EnableContInput.vi					
	X X					ProfiledPIDController_Execute.vi		Single call LabVIEW style function.			
	X	(X	SI		ProfiledPIDController_GetGoal.vi					
	X		X			ProfiledPIDController_GetPeriod.vi					
		(X				ProfiledPIDController GetPID.vi		WPILIB has separate getters.			
	X	(X			ProfiledPIDController GetPositionError.vi					
	X	(X			ProfiledPIDController_GetSetpoint.vi					
	X	(SI		ProfiledPIDController GetTolerance.vi					
	X		X			ProfiledPIDController GetVelocityError.vi					
	X		X			ProfiledPIDController New.vi					
	X		X			ProfiledPIDController NewPeriod.vi					
	X		X			ProfiledPIDController Reset PosOnly.vi					
	X		$\frac{X}{X}$			ProfiledPIDController Reset PosVel.vi					
	X		X			ProfiledPIDController Reset.vi					
	X		$\frac{\lambda}{X}$			ProfiledPIDController SetConstraints.vi					
	$\begin{array}{c c} X & Z \\ \hline X & Z \end{array}$		$\frac{\lambda}{X}$			ProfiledPIDController SetGoal PosOnly.vi					
	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$		$\frac{\lambda}{X}$			ProfiledPIDController SetGoal.vi					
						ProfiledPIDController_SetGoal.vi					
	X		X								
	X		X			ProfiledPIDController_SetPID.vi					
	X		X			ProfiledPIDController_SetTolerance_PosOnly.vi					
	X	(X	SI		ProfiledPIDController_SetTolerance_PosVel.vi					
	Implemented		Mer		Test Routine		Function Prototype	Notes	Code Review	Test Program	Error Checking
RAMSETE			X			Ramsete_AtReference.vi	AtReference				
	X		X	X		Ramsete_Calculate_Trajectory.vi	calculate_trajectory				
	X		X	X		Ramsete_Calculate.vi	calculate				
	X		X	X		Ramsete_Diff_DO_Eng.vi					
	X	(X		X		Ramsete_Diff_DO_SI.vi					
	X					Ramsete_Execute_ENG.vi	Use this one!!				
	X					Ramsete_Execute_PackTuning_ENG.vi					
	X					Ramsete_Execute_PackTuning.vi					
	X					Ramsete_Execute.vi					
	X		X	SI		Ramsete_New_B_Z.vi	new(b, zeta)				
	X		X	SI		Ramsete_New.vi	new				
	X		X	SI		Ramsete_SetEnabled.vi	SetEnabled				
	X		X	SI		Ramsete_SetTolerance.vi	SetTolerance				
	X		X	X		Ramsete_SINC.vi	sinc	internal			

FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 11/06/2022 – added various routines Execution Optimized Routine Not WPILIB Menu Item Function Prototype Notes SIMPLE MOTOR FEEDFORWARD $X \mid X$ SimpleMotorFF Calculate CalcAccel.vi X SimpleMotorFF Calculate NextV Dt.vi Χ X X X X SI SimpleMotorFF Calculate.vi public double calculate(double velocity, double acceleration) X X X SI SimpleMotorFF_CalculateVelocityOnly.vi public double calculate(double velocity) public double maxAchievableAcceleration(double maxVoltage, Χ X Χ SimpleMotorFF MaxAchieveAccel.vi double velocity) Χ X Χ SimpleMotorFF MaxAchieveVel.vi public double maxAchievableVelocity(double maxVoltage, double Χ X X SimpleMotorFF MinAchieveAccel.vi public double minAchievableAcceleration(double maxVoltage, double velocity) Χ Χ SimpleMotorFF_MinAchieveVel.vi X public double minAchievableVelocity(double maxVoltage, double acceleration)
public SimpleMotorFeedforward(double ks, double kv, double ka) SimpleMotorFF New.vi Χ Χ SI X public SimpleMotorFeedforward(double ks, double kv) '======== **GEOMETRY** '======== Routin VI Name Function Prototype Notes COORDINATE AXIS X CoordAxis D.vi X X SI SI CoordAxis_E.vi Χ Χ X X X SI CoordAxis N.vi X Χ SI CoordAxis New.vi Χ X SI X CoordAxis S.vi Χ Χ X SI CoordAxis U.vi XX X SI CoordAxis W.vi Function Prototype Notes COORDINATE SYSTEM XX Χ SI CoordSystem Convert Pose3d.vi CoordSystem Convert Rotation3d.vi XX X SI XX X SI CoordSystem_Convert_Translation3d.vi X SI CoordSystem_Convert_Transform3d.vi X X Χ SI X CoordSystem_EDN.vi Χ Χ X SI X CoordSystem_NED.vi X X Χ X SI X CoordSystem New.vi X SI X CoordSystem NWU.vi X Function Prototype Notes

boolean equals(other obj)

pose2d exp(twist2d twist)

POSE2D

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SI

X SI

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Pose2d Div.VI

Pose2d Exp.vi

Pose2d Equals.VI

utines									_				
	Χ	X		Χ	SI			Pose2d_getRotation.vi	rotation2d getRotation()	can also use cluster unpack			
	Χ	X		Χ	SI			Pose2d_getTranslation.vi	translation2d getTranslation()	can also use cluster unpack			
	Χ	Χ	Χ	Χ	SI			Pose2d_getXY.vi	J V	'			
	X	X	X	X	SI			Pose2d_getXYAngle.vi					
	X	X		X	I			Pose2d_Interpolate.vi					
	X	X		X	X			Pose2d_Log.vi	twist2d log(pose2d end)				
				X	SI			Pose2d_Log.vi	transform2d minus(pose2d other)				
	X	X											
	X	X		X	SI			Pose2d_New_TRRO.vi	pose2d new(translation2d, rotation2d)				
	X	Χ		Χ	SI			Pose2d_New.vi	pose2d new(double x, double y, rotation2d)				
	X	Χ		Χ	SI			Pose2d_Plus.vi	pose2d plus(transform2d other)				
	Χ	Χ		Χ	SI			Pose2d_RelativeTo.vi	pose2d relativeto(pose2d other)				
	Χ	X			SI			Pose2d_Times.vi					
	X	X		Χ	SI			Pose2d_TransformBy.vi	pose2d transformby(transform2d other)				
									pose2d new()	can use cluster constant			
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
POSE3D	X	X		_	SI	T -		Pose3d Div.vi					
1 00235	X	X		X	SI			Pose3d_Equals.VI					
								Pose3d_Exp.vi					
	X	X		X	X			Pose3d_Exp.vi					
	X	Χ		Χ	SI			Pose3d_getRotation.vi					
	X	Χ		Χ	SI			Pose3d_getTranslation.vi					
	Χ	X	Χ	Χ	SI			Pose3d_getXYZ.vi					
	X	X		X	1			Pose3d_Interpolate.vi					
	Χ	X		Χ	Χ			Pose3d_Log.vi					
	Χ	X		Χ	SI			Pose3d Minus.vi					
	X	Χ		Χ	SI			Pose3d_New.vi					
	X	X		X	SI			Pose3d New Default.vi					
	X	X			SI			Pose3d New Pose2d.vi					
	X	X		Х	SI			Pose3d New Trans3dRot3d.vi					
		\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \											
	X	X		X	SI			Pose3d_Plus.vi					
	X	Χ		Χ	SI			Pose3d_RelativeTo.vi					
	X	Χ		No	SI			Pose3d_RotationVectorToMatrix.vi					
	X	X		X	SI			Pose3d_ToPose2d.vi					
	X	X			SI			Pose3d Times.vi					
	Χ	X		Χ	SI			Pose3d TransformBy.vi					
QUATEDWQV [(Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program		Function Prototype	Notes	Code Review	Test Program	Error Checking
QUATERNION	X	Χ		Χ	SI			Quaternion_Equals.vi					
	X	X		Χ	SI			Quaternion_Get_All.vi					
	Χ	Χ		Χ	SI			Quaternion_Get_LVQuat.vi					
	Χ	X		X	SI			Quaternion_Get_Vect.vi					
	Χ	X		Χ	SI			Quaternion_Get_W.vi					
	Χ	X		Χ	SI			Quaternion_Inverse.vi					
	Χ	X		Χ	SI			Quaternion New.vi					
	X	Χ		Χ	SI			Quaternion New Default.vi					
	X	X		X	SI			Quaternion New LVQuat.vi					
	X	X		X	SI			Quaternion Normalize.vi					
	X	X		X	SI			Quaternion Plus.vi					
		X		X	SI			Quaternion_Plus.vi Quaternion_Times.vi					
						i .							
-	X	X		X	SI			Quaternion ToRotationVector.vi					

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	Implemented	Documented	Not WPILIB	Menu Item	ecutior	Test Routine	mple F				Code Review	st Program	Error Che
			≥		Ě		Sa	VI Name	Function Prototype	Notes	රි	Test	<u>E</u>
ROTATION2D	Χ	Χ		X	SI			Rotation2d_CreateAngle.vi	rotation2d new(double value)				
	Χ	Χ		Χ	SI			Rotation2d_CreateAngleDegrees.vi	rotation2d fromDegrees(double degrees)	convert to radians then create			
	X X X	X X X		X	SI SI			Rotation2d_CreateAngleRotations.vi Rotation2d_CreateXY.vi Rotation2d_Div.vi	rotation2d new(double x, double y)				
	X	X		X	SI	-		Rotation2d_Div.vi Rotation2d_Equals.vi	boolean equals(rotation2d other)				
	X	X	X	X	SI	-		Rotation2d_GetAngleCosSin.vi	boolean equals (Totation2d other)	New 1/26/21			
	X	X		X	SI			Rotation2d GetCos.VI	double getCos()	use cluster unpack			
	X	X		X	SI			Rotation2d_GetDegrees.VI	double getDegrees()	use cluster unpack, then convert to degree			
	Χ	Χ		Χ	SI			Rotation2d_GetRadians.VI	double getRadians()	use cluster unpack			
	Χ	Χ		Χ	SI			Rotation2d_GetRotations.vi	· ·				
	Χ	Χ		Χ	SI			Rotation2d_GetSin.VI	double getSin()	use cluster unpack			
	Χ	Χ		X	SI			Rotation2d_GetTan.VI	double getTan()	can calculate			
	X	Χ		X	SI			Rotation2d_Interpolate.vi					
	X	Χ		X	SI			Rotation2d_Minus.vi	rotation2d minus(rotation2d other)				
	X	Χ		Χ	SI			Rotation2d_Plus.vi	rotation2d plus(rotation2d other)				
	X	Χ		X	SI	_		Rotation2d_RotateBy.vi	rotation2d rotateby(rotation2d other)				
	X	X		X	SI	-		Rotation2d_Times.vi	rotation2d times(double scalar)				
	Χ	Χ		Χ	SI			Rotation2d_UnaryMinus.vi	rotation2d unaryminus() rotation2d new()	can use cluster constant			
	ted	pe,	9	_	Optimiz	,ue	rogram				iew	am	okina
	mplemented	Occumented	Jot WPILIB	Jenu Item	Execution Optimiz	est Routine	sample Program	VI Name	Function Prototyne	Notes	Sode Review	est Program	Error Checking
ROTATION3D	X Implemented	X Documented	Not WPILIB	X Menu Item	ල Execution Optimized	Test Routine	Sample Program	VI Name Rotation3d Create AxisAngle.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
ROTATION3D	X X Implemented	X X Documented	Not WPILIB	X X Menu Item	い Secution Optimiz	Test Routine	Sample Program	Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
ROTATION3D	Χ	X X X	Not WPILIB	X X X	SI	Test Routine	Sample Program	Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
ROTATION3D	X X X	X X X	Not WPILIB	X X X	SI SI SI	Test Routine	Sample Program	Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
ROTATION3D	X X X X	X X X X	Not WPILIB	X X X X	SI SI I SI	Test Routine	Sample Program	Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi Rotation3d_Create_RollPitchYaw.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
ROTATION3D	X X X X X	X X X X X	Not WPILIB	X X X	SI SI I SI	Test Routine	Sample Program	Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi Rotation3d_Create_RollPitchYaw.vi Rotation3d_Create_RotMatrix.vi	Function Prototype	Notes	Code Review	Test Program	Fror Checking
ROTATION3D	X X X X X X	X X X X X X	Not WPILIB	X X X X X	SI SI I SI I SI	Test Routine	Sample Program	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 Review	Test Program	Error Cherking
ROTATION3D	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	Test Routine	Sample Program	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 Review	Test Program	Fror Checking
ROTATION3D	X X X X X X X	X X X X X X X	Not WPILIB	X X X X X X	SI SI I SI I SI SI	Test Routine		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 Rotation3d GetAxisAngle.vi	Function Prototype	Notes	Code Review	Test Program	Pror Checking
ROTATION3D	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 SI	Test Routine		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 Review	Test Program	Frror Checking
ROTATION3D	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 I SI I SI SI SI SI SI	Test Routine		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 Rotation3d GetAxisAngle.vi Rotation3d GetQuaternion.vi Rotation3d GetXYZ.vi Rotation3d Interpolate.vi	Function Prototype	Notes	Code Review	Test Program	Frror Checking
ROTATION3D	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 SI I SI I SI SI SI SI SI	Test Routine		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 Rotation3d_GetAxisAngle.vi Rotation3d_GetQuaternion.vi Rotation3d_GetXYZ.vi Rotation3d_Interpolate.vi Rotation3d_Minus.vi	Function Prototype	Notes	Code Review	Test Program	Fror Checking
ROTATION3D	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 SI I SI I SI SI SI SI SI SI	Test Routine		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 Rotation3d_GetAxisAngle.vi Rotation3d_GetQuaternion.vi Rotation3d_GetXYZ.vi Rotation3d_Interpolate.vi Rotation3d_Minus.vi Rotation3d_Plus.vi	Function Prototype	Notes	Code Review	Test Program	Fror Checking
ROTATION3D	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 X X X X	SI SI SI SI SI SI SI SI	Test Routine		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 Rotation3d GetAxisAngle.vi Rotation3d GetQuaternion.vi Rotation3d GetXYZ.vi Rotation3d Interpolate.vi Rotation3d Minus.vi Rotation3d Plus.vi Rotation3d RotateBy.vi	Function Prototype	Notes	Code Review	Test Program	Error Checkina
ROTATION3D	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 X X X X X X X	SI SI SI SI SI SI SI SI	Test Routine		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 Rotation3d_Times.vi	Function Prototype	Notes	Code Review	Test Program	Error Checkina
ROTATION3D	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 X X X X X X X X X X X	SI SI SI I SI SI SI SI SI SI SI SI	Test Routine		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 Rotation3d ToRotation2d.vi	Function Prototype	Notes	Code Review	Test Program	Frror Checking
ROTATION3D	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 X X X X X X X	SI SI SI SI SI SI SI SI	Test Routine		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 Rotation3d_Times.vi	Function Prototype	Notes	Code Review	Test Program	
ROTATION3D	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 X X X X X X X	SI SI SI SI SI SI SI SI	Routine	mple Program	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_Times.vi Rotation3d_ToRotation2d.vi Rotation3d_UnaryMinus.vi				Program	z z z z z z z z z z z z z z z z z z z
	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 X X X X X X X X X X X X X X X X X X			mple Program	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_RotateBy.vi Rotation3d_ToRotation2d.vi Rotation3d_UnaryMinus.vi	Function Prototype	Notes	Code Review Code Review		Checking
ROTATION3D TRANSFORM2D	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 X X X X X X X	SI SI SI SI SI SI SI SI	Routine	mple Program	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_Times.vi Rotation3d_ToRotation2d.vi Rotation3d_UnaryMinus.vi				Program	Error Checking

X X X	X	X X X X X X X	SI SI			Transform2d_Equals.VI Transform2d_GetRotation.VI Transform2d_GetTranslation.VI Transform2d_GetXY.vi Transform2d_GetXYAngle.vi Transform2d_Inverse.vi Transform2d_Plus.vi Transform2d_Times.vi	boolean equals(other transform2d) rotation2d getRotation() translation2d getTranslation() transform inverse() transform2d times(double scalar) transform2d new()	use cluster unpack use cluster unpack new can use cluster constant			
X X X X X	X	X X X X	SI SI SI SI Si SI			Transform2d_GetTranslation.VI Transform2d_GetXY.vi Transform2d_GetXYAngle.vi Transform2d_Inverse.vi Transform2d_Plus.vi	translation2d getTranslation() transform inverse() transform2d times(double scalar)	use cluster unpack new			
X X X X	X	X X X	SI SI SI Si SI			Transform2d_GetXY.vi Transform2d_GetXYAngle.vi Transform2d_Inverse.vi Transform2d_Plus.vi	transform inverse() transform2d times(double scalar)	new			
X X X	X	X X X	SI SI Si SI			Transform2d_GetXYAngle.vi Transform2d_Inverse.vi Transform2d_Plus.vi	transform2d times(double scalar)				
X X X		X	SI Si SI			Transform2d_Inverse.vi Transform2d_Plus.vi	transform2d times(double scalar)				
X	8/7	X	Si SI		ľ	Transform2d_Plus.vi	transform2d times(double scalar)				
X	RI7		SI					can use cluster constant			
	8/7	X				Transform2d_Times.vi		can use cluster constant			-
ocumented	8/7		nized				transform2d new()	can use cluster constant			1
ocumented	8I7		nized								
X X X X X X X X	Not WPILIB	X X X X X X X X X X X X X X X X X X X	IS I	Test Routine		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	Function Prototype	Notes	Code Review	Test Program	
		X									
			pəz								
ocumented	Jot WPILIB	Jenu Item	Execution Optimized	est Routine	sample Program	VI Name	Function Prototyne	Notes	ode Review	est Program	
X X Documented	Not WPILIB	X Menu Item	ত Execution	Test Routine	Sample	VI Name Translation2d_Create_DistAng.vi Translation2d_Create_vi	Function Prototype translation2d new(double x, double v,)	Notes	Code Review	Test Program	
X	Not WPILIB		S S Execution	Test Routine	Sample	Translation2d_Create_DistAng.vi Translation2d_Create.vi	Function Prototype translation2d new(double x, double y)	Notes	Code Review	Test Program	
X X X	Not WPILIB	X	S S Execution	Test Routine	Sample	Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi	translation2d new(double x, double y)	Notes	Code Review	Test Program	
X X X	Not WPILIB	X X	IS IS Execution	Test Routine	Sample	Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi Translation2d_Equals.vi		Notes	Code Review	Test Program	
X X X X	Not WPILIB	X X X	IS Execution	Test Routine	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	
X X X X X	Not WPILIB	X X X X	IS IS Execution	Test Routine	Sample	Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi Translation2d_Equals.vi Translation2d_GetAngle.vi Translation2d_GetDistance.vi	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other)		Code Review	Test Program	
X X X X X X	Not WPILIB	X X X X X	IS IS Execution		Sample	Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi Translation2d_Equals.vi Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.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	
X X X X X X X		X X X X X X	IS I		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	
X X X X X X X X		X X X X X X X	IS I		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	
X X X X X X X X		X X X X X X X			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	
X X X X X X X X X		X X X X X X X X			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	
X X X X X X X X X X		X X X X X X X X X	SI Execution SI SI SI SI SI SI SI S		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 new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() double getY() translation2d minus(translation2d other)	can use cluster unpack can use cluster unpack	Code Review	Test Program	
X X X X X X X X X X X		X X X X X X X X X X X	S		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	
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	S		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_GetX.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	
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	S		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_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	
X X X X X X X X X X X X		X X X X X X X X X X X X	S		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_GetX.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	
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	S		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_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	
	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 X SI X X Si	X	X	X X SI Transform3d_Create_Trans3dRot3d.vi X SI Transform3d_Div.vi X X SI Transform3d_Equals.VI X X SI Transform3d_GetRotation3d.VI X X SI Transform3d_GetTranslation3d.VI X X X SI Transform3d_GetXYZ.vi X X SI Transform3d_Inverse.vi X X Si Transform3d_Plus.vi	X X SI Transform3d_Create_Trans3dRot3d.vi X SI Transform3d_Div.vi X X SI Transform3d_Equals.VI X X SI Transform3d_GetRotation3d.VI X X SI Transform3d_GetTranslation3d.VI X X X SI Transform3d_GetXYZ.vi X X SI Transform3d_Inverse.vi X X Si Transform3d_Plus.vi	X X SI Transform3d_Create_Trans3dRot3d.vi X SI Transform3d_Div.vi X X SI Transform3d_Equals.VI X X SI Transform3d_GetRotation3d.VI X X SI Transform3d_GetTranslation3d.VI X X SI Transform3d_GetXYZ.vi X X SI Transform3d_Inverse.vi X X Si Transform3d_Plus.vi	X X SI Transform3d_Create_Trans3dRot3d.vi X SI Transform3d_Div.vi X X SI Transform3d_Equals.VI X X SI Transform3d_GetRotation3d.VI X X SI Transform3d_GetTranslation3d.VI X X SI Transform3d_GetXYZ.vi X X SI Transform3d_Inverse.vi X X Si Transform3d_Plus.vi	X X SI Transform3d_Create_Trans3dRot3d.vi X SI Transform3d_Div.vi X X SI Transform3d_Equals.VI X X SI Transform3d_GetRotation3d.VI X X SI Transform3d_GetTranslation3d.VI X X SI Transform3d_GetXYZ.vi X X SI Transform3d_Inverse.vi X X Si Transform3d_Plus.vi

DIFFERENTIAL DRIVE KINEMATICS X X

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

VI Implementation	List								_				
s routines													
	X	Χ		Χ	SI			Translation3d_Div.vi					
		Χ		Χ	SI			Translation3d_Equals.vi					
	X	Χ		Χ	SI			Translation3d_GetDistance.vi					
	X	Χ		Χ	SI			Translation3d_GetNorm.VI					
	X	Χ	Χ	Χ	SI			Translation3d_GetXYZ.vi					
	X	Χ		Χ	SI			Translation3d_Interpolate.vi					
	X	Χ		Χ	SI			Translation3d_Minus.vi					
	X	Χ		Χ	SI			Translation3d_Plus.vi					
	X	Χ		Χ				Translation3d_RotateBy.vi					
	X	Χ		Χ	SI			Translation3d_Times.vi					
	X	Χ		Χ	SI			Translation3d_ToTranslation2d.vi					
	X	Χ		Χ	SI			Translation3d_UnaryMinus.vi					
TWIST2	X X	X Documented	X Not WPILIB X	X X Menu Item	ଦ୍ର ଓ Execution Optimized ଦ	X X X Test Routine	Sample Program	VI Name Twist2d_Create.vi Twist2d_Equals.VI Twist2d_GetAll.VI VI Name Twist3d_Create.vi Twist3d_Equals.VI Twist3d_Equals.VI Twist3d_GetAll.VI	Function Prototype twist new(x, y, theta) boolean equals(obj other) Function Prototype	Notes	Code Review Code Review	Test Program	Error Checking 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
CHASSIS SPEED	s X	X			SI			ChassisSpeeds_FromFieldRelativeChassisSpeeds.VI	Ţ.				
	X	Χ		Χ	SI			ChassisSpeeds_FromFieldRelativeSpeeds.VI	chassisspeeds fromFieldRelativeSpeeds(double x, double y,				
									double angvel, rotation2d robotangle)				
	X	Χ	Χ	X	SI			ChassisSPeeds_GetXYOmega.vi					
	X	Χ		Χ	SI			ChassisSpeeds_New.vi	chassisspeeds new (double xvel, double yvel, double angvel)				
									chassisspeeds new ()	can use cluster constant			
	mented	mented	VPILIB	ı İtem	ution Optimized	Routine	ole Program				: Review	Program	. Checking

Function Prototype

diffDriveKine new(double trackWidth)

chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds)

diffDriveWheelSpeed toWheelSpeeds(chassisSpeeds)

Notes

DiffKinematics_New.vi

DiffKinematics_toChassisSpeed.vi

DiffKinematics_toWheelSpeed.vi

XIIX

X X X X SI X

X X X

Revision 2.X 11/06/2022 – added various routines Function Prototype Notes **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 MecaKinematics New.vi X X X X X X Χ MecaKinematics SetInverseKinematics.vi Χ MecaKinematics ToChassisSpeeds.vi XX MecaKinematics_ToWheelSpeeds.vi XX Χ MecaKinematics_ToWheelSpeedsZeroCenter.vi VI Name Function Prototype Notes MECANUM DRIVE MOTOR VOLTAGE nothing done Function Prototype Notes **MECANUM DRIVE ODOMETRY** MecaOdometry_Execute.vi X X MecaOdometry_GetKinematics.vi Χ Χ MecaOdometry GetPose.vi Χ MecaOdometry New.vi X X XX Χ MecaOdometry_NewDefaultPose.vi XX X MecaOdometry Reset.VI XX X MecaOdometry_Update.vi MecaOdometry_UpdateWithTime.vi $X \mid X$ X

FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 11/06/2022 – added various routines Execution Optim Menu Item Function Prototype Notes MECANUM DRIVE WHEEL SPEEDS X MecaWheel New.Vi public MecanumDriveWheelSpeeds(double frontLeftMetersPerSecond, double frontRightMetersPerSecond, double rearLeftMetersPerSecond, double rearRightMetersPerSecond) X X X X SI MecaWheel GetAll.vi MecaWheel Normalize.vi public void normalize(double . attainableMaxSpeedMetersPerSecond) Optin Function Prototype SWERVE DRIVE KINEMATICS X X SwerveKinematics New4.VI For 4 module drives X X X X SwerveKinematics NewX.VI uses array as input X X X SwerveKinematics NormalizeWheelSpeeds.vi public static void normalizeWheelSpeeds(SwerveModuleState[] moduleStates, double attainableMaxSpeedMetersPerSecond) Χ XX SwerveKinematics ToChassisSpeeds4.VI For 4 module drives X Χ $X \mid X \mid X$ SwerveKinematics ToChassisSpeedsX.VI uses array as input SwerveKinematics ToSwerveModuleStates.VI public SwerveModuleState[] X X toSwerveModuleStates(ChassisSpeeds chassisSpeeds, Translation2d centerOfRotationMeters) SwerveKinematics ToSwerveModuleStatesZeroCenter.VI X public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds) public SwerveDriveKinematics(Translation2d... wheelsMeters) variable parameters (replace with array and "4" calls) variable parameters (replace with public ChassisSpeeds toChassisSpeeds(SwerveModuleState... array and "4" calls) Menu Item VI Name Function Prototype Notes SWERVE DRIVE ODOMETRY SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi Χ SwerveOdometry GetPosition.VI public Pose2d getPoseMeters() X X SwerveOdometry_New.VI public SwerveDriveOdometry(SwerveDriveKinematics kinematics, X X Rotation2d gyroAngle, Pose2d initialPose) SwerveOdometry_NewZeroCenter.VI public SwerveDriveOdometry(SwerveDriveKinematics kinematics, X Χ Rotation2d gyroAngle) XX Χ SwerveOdometry ResetPosition.VI public void resetPosition(Pose2d pose, Rotation2d gyroAngle) X X X X SwerveOdometry Update4.VI For 4 module drives $X \mid X \mid X \mid X$ SwerveOdometry UpdateWithTime4.VI For 4 module drives SwerveOdometry_UpdateWithTimeX.VI $X \mid X \mid X \mid X$ uses array as input X X X X SwerveOdometry_UpdateX.VI uses array as input variable parameters (replace with public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState... moduleStates) array and "4" calls) public Pose2d update(Rotation2d gyroAngle, SwerveModuleState... moduleStates) variable parameters (replace with array and "4" calls) Execution Optimized Sample Program Routine Test Program Vot WPILIB Jenu Item

Function Prototype

Notes

FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 11/06/2022 – added various routines SWERVE DRIVE MODULE STATE X X X SI SwerveModuleState CompareTo.vi public int compareTo(SwerveModuleState o) X SI X X SwerveModuleState Get.vi Χ X Χ SI SwerveModuleState_New.vi public SwerveModuleState(double speedMetersPerSecond, public SwerveModuleState optimize(SwerveModuleState desired, Χ X Χ SI SwerveModuleState Optimize.vi Rotation2d angle) '======== SPLINE '======== Menu Item VI Name Function Prototype Notes **CUBIC HERMITE SPLINE** protected SimpleMatrix getCoefficients() not needed, use cluster unpack CubicHermiteSpline_getControlVectorFromArrays.vi private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) X X X CubicHermiteSpline makeHermiteBasis.vi private SimpleMatrix makeHermiteBasis() public CubicHermiteSpline(double[] xInitialControlVector, double[] X X X CubicHermiteSpline New.vi xFinalControlVector, double[] yInitialControlVector, double[] vFinalControlVector) ltem Function Prototype Notes POSE WITH CURVATURE X public PoseWithCurvature(Pose2d poseMeters, double PoseWithCurve New.vi curvatureRadPerMeter) public PoseWithCurvature() can use cluster constant public Pose2d poseMeters not needed, use cluster unpack public double curvatureRadPerMeter. not needed, use cluster unpack Execution Optii Routin Menu Item Function Prototype Notes QUINTIC HERMITE SPLINE X QuinticHermiteSpline getControlVectorFromArrays.vi private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) QuinticHermiteSpline makeHermiteBasis.vi private SimpleMatrix makeHermiteBasis() X X Χ QuinticHermiteSpline_New.vi public QuinticHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector)
protected SimpleMatrix getCoefficients() not needed, use cluster unpack Execution Optimized

VI Name

Spline getPoint.vi

SPLINE (Abstract class) X X

Function Prototype

Spline(int degree)

public static class ControlVector

public PoseWithCurvature getPoint(double t)

public ControlVector(double[] x, double[] y)

Notes

implemented as data structure

ibrary – VI Implementation L	ıδι												
ed various routines													
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
SPLINE HELPER	X	\overline{X}	$\overline{}$	\overline{X}	SI			SplineHelp GetCubicCtrlVector.vi	private static Spline.ControlVector getCubicControlVector(double				
0: =:::= ::=:: =::		,		,	٠.				scalar, Pose2d point)				
	X	X		X		X		SplineHelp_GetCubicCtrlVectorsFromWayPts.vi	public static Spline.ControlVector[] getCubicControlVectorsFromWaypoints(Pose2d start, Translation2d[] interiorWaypoints, Pose2d end)				
	X	X	Χ	Χ				SplineHelp_GetCubicCtrlVectorsFromWeightedWayPts.vi	- ,,				
	Χ	Χ	Χ	No				SplineHelp_GetCubicSpline_Calc1.vi		internal			
	Χ	Χ	Χ	No				SplineHelp_GetCubicSpline_Calc2.vi		internal			
	Χ	Χ	Χ	No				SplineHelp_GetCubicSpline_Calc3.vi		internal			
	X	X		X		X		SplineHelp_getCubicSplinesFromControlVectors.vi	public static CubicHermiteSpline[] getCubicSplinesFromControlVectors(Spline.ControlVector start, Translation2d[] waypoints, Spline.ControlVector end)				
	X	X		Χ	SI			SplineHelp_GetQuinticCtrlVector.vi	Translation2d[] waypoints, Spline.ControlVector end) private static Spline.ControlVector getQuinticControlVector(double scalar, Pose2d point)				
								SplineHelp_GetQuinticCtrlVectorsFromWayPts.vi	public static List <spline.controlvector> getQuinticControlVectorsFromWaypoints(List<pose2d> waypoints)</pose2d></spline.controlvector>	REMOVED 2762			
								SplineHelp_GetQuinticCtrlVectorsFromWeightedWayPts.vi		REMOVED 2762			
	X	X		X				SplineHelp_getQuinticSplinesFromControlVectors.vi	public static QuinticHermiteSpline[] getQuinticSplinesFromControlVectors(Spline.ControlVector[] controlVectors)				
		Χ	Χ	Χ				SplineHelp_GetQuinticSplinesFromWeightedWayPts.vi	,	New 2762			
	Χ	Χ		Χ				SplineHelp_GetQuinticSplinesFromWayPts.vi		New 2762			
	X	X		No				SplineHelp_ThomasAlgorithm.vi	private static void thomasAlgorithm(double[] a, double[] b, double[] c, double[] d, double[] solutionVector)	internal			
	(Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine		VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
SPLINE PARAMETERIZER	X	X		X				SplineParam_Spline_T0_T1.vi	public static List <posewithcurvature> parameterize(Spline spline,</posewithcurvature>				
	X	Χ		X		X		SplineParam_Spline.vi	double t0, double t1) public static List <posewithcurvature> parameterize(Spline spline)</posewithcurvature>				
	X	X	X	No				SplineParam StackGet.vi		internal			
	X	X	X	No				SplineParam StackPop.vi		internal			
	^												

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

TRAJECTORY	x Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine	E E E E E E E E E E E E E E E E E E E	Function Prototype	Notes	Code Review	Test Program	Error Checking
	X	X		X			Trajectory equals.vi	boolean equals(other obj)	FUTURE			
	X	X		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			
	Χ	Χ		No	SI		Trajectory_lerp_double.vi	private static double lerp(double startValue, double endValue, double t)	internal			
	X	Χ		No	SI		Trajectory_lerp_Pose.vi	private static Pose2d lerp(Pose2d startValue, Pose2d endValue, double t)	internal			
	Χ	Χ		Χ	SI		Trajectory_New_Empty.vi	,				
	Χ	Χ		Χ	SI		Trajectory_New.vi	public Trajectory(final List <state> states)</state>				
	X	Χ		Χ			Trajectory_RelativeTo.vi	public Trajectory relativeTo(Pose2d pose)				

various routines													
	Χ	Χ		X				Trajectory_Sample.vi	public State sample(double timeSeconds)				
	Χ	X	X	X				Trajectory_SampleReverse.vi		Sample in reverse order. Negate			
		, ,	-							sample.			
	Χ	Χ		X				Trajectory_TransformBy.vi	public Trajectory transformBy(Transform2d transform)				
									public Pose2d getInitialPose()	can use cluster unpack, array index			
l													
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Fest Program	Error Checking
TRAJECTORY_STATE		X		\overline{X}	SI	_ <u>' </u>		TrajectoryState_Equals.vi	boolean equals(other obj)				
	X	X	X	X	SI			TrajectoryState GetAll.vi	accident equality can be easy y				
	X	X		X	SI			TrajectoryState GetPose.vi					
	X	X		X	O.			TrajectoryState Interpolate.vi	State interpolate(State endValue, double i)				
	X	X		X	SI			TrajectoryState_New.vi	public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double				
									curvatureRadPerMeter)	+			
									public State()				
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program				Code Review	est Program	Error Checking
			Ž		<u> </u>	_ "	ίχ	VI Name	Function Prototype	Notes	Ü	<u> </u>	<u> </u>
TRAJECTORY CONFIG	X	X		X				TrajectoryConfig_AddConstraint.vi	public TrajectoryConfig addConstraint(TrajectoryConstraint constraint)	Implemented differently, can't duplicate.			
	Χ	X		X				TrajectoryConfig_AddConstraints.vi	public TrajectoryConfig addConstraints(List extends TrajectoryConstraint constraints)	Implemented differently, can't duplicate.			
	X	X		X	SI			TrajectoryConfig_Create.vi	public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq)				
	Χ	X		X				TrajectoryConfig_GetCentripetalAccel.vi					
	X	X	X	X				TrajectoryConfig_GetConstraints.vi	public List <trajectoryconstraint> getConstraints()</trajectoryconstraint>	Implemented differently, can't duplicate.			
	Χ	X		X				TrajectoryConfig_GetEndVelocity.vi	public double getEndVelocity()	can use cluster unpack			
	Χ	X		X				TrajectoryConfig_GetKinematicsDiffDrive.vi					
	Χ	X		X				TrajectoryConfig_GetKinematicsMecanumfDrive.vi					
	Χ	Χ		X				TrajectoryConfig_GetKinematicsSwerveDrive.vi					
	X	X	X	X				TrajectoryConfig_GetMaxVelAccel.vi					
	X	X		X				TrajectoryConfig_GetStartVelocity.vi	public double getStartVelocity()	can use cluster unpack			
	X	X		X				TrajectoryConfig_GetVoltageDiffDrive.vi	1,1,1,1,2,1,2	 			
	X	X		X	-			TrajectoryConfig_IsReversed.vi	public boolean isReversed()	can use cluster unpack			
	X	X	X	X	SI			TrajectoryConfig_setCentripetalAccel.vi	15.7.4.0.6.17.04.11.11	1			
	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)				
	Χ	X		X	SI			TrajectoryConfig_setReversed.vi	public TrajectoryConfig setReversed(boolean reversed)				
	X	X		X				TrajectoryConfig_SetStartVelocity.vi	public TrajectoryConfig setStartVelocity(double startVelocityMetersPerSecond)				
	Χ	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 "SET" ROUTINES FOR OTHER				

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

### PALECTORY GENERATE (Durout Vector) ### PALECTORY GENERATE (Durout Vector) ### PALECTORY FARAMETERIZE CONSTRAINED STATE ### PALECTORY FARAMETERIZE CONSTRA	RC LabVIEW Trajectory Library – VI Implementation	LIST											
TRAJECTORY GENERATE X X X X X X X X X	vision 2.X 11/06/2022 – added various routines	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	mple	Function Prototype	Notes	Code Review	Test Program	
TRAJECTORY DENERATE (Control Vector) TRAJECTORY DENERATE (Control Vector) TRAJECTORY PARAMETERIZE CONTROL Vector) TRAJECTORY PARAMETERIZE CONTROL Vector) TRAJECTORY PARAMETERIZE CONTROL Vector) TRAJECTORY PARAMETERIZE CONTROL Vector) TRAJECTORY PARAMETERIZE (CONTROL Vector) TRAJECTORY PARAMETERIZE CONTROL VECTOR Vector) TRAJECTORY PARAMETERIZE CONTROL Vector) TRAJECTORY PARAMETERIZE CONTROL VECTOR Vect	TRAJECTORY GENERAT	<u>X</u>				4		•	public static Trajectory generateTrajectory(Spline.ControlVector	uses cubic splines			_
TRAJECTORY PARAMETERIZE TRAJECTORY PARAMETERI		X	X		X			TrajectoryGenerate_Make_Cubic.vi	initial, List <translation2d> interiorWaypoints, Spline.ControlVecto end, TrajectoryConfig config.) public static Trajectory generateTrajectory(Pose2d start, List<translation2d> interiorWaypoints, Pose2d end,</translation2d></translation2d>				
TRAJECTORY PARAMETERIZE TRAJECTORY PARAMETERI					- V			Trainatory/Caparata Maka Caparia vi	TrajectoryConfig config)	Lies this spall			
TRAJECTORY PARAMETERIZE TRAJECTORY PARAMETERI				_^									
TRAJECTORY PARAMETERIZE TRAJECTORY PARAMETERI					^			Trajectory Certerate_Make_Quinte_Curvect.vi	controlVectors, TrajectoryConfig config)	uses quintes spinies			
TRAJECTORY PARAMETERIZE TRAJECTORY PARAMETERI		X		X	X								
TRAJECTORY PARAMETERIZE TRAJECTORY PARAMETERI		X	X		X			TrajectoryGenerate_Make_Quintic.vi	public static Trajectory generateTrajectory(List <pose2d></pose2d>	uses quintic splines			
TRAJECTORY PARAMETERIZE CONSTRAINED STATE TRAJECTORY PARAMETERIZE C		X	X		X			TrajectoryGenerate_splinePointsFromSplines.vi	public static List <posewithcurvature></posewithcurvature>				
TRAJECTORY PARAMETERIZE CONSTRAINED STATE TRAJECTORY PARAMETERIZE C									splinePointsFromSplines(Spline[] splines)				
TRAJECTORY GENERATE (Control Vector) Description Procession Process		plemented	ocumented	ot WPILIB	enu Item	cecution Optimizea	sst Routine	ample Program			ode Review	sst Program	ror Checking
PRAJECTORY PARAMETERIZE Parameterize Parameter		7	ŭ	ž	Š	щ	76	ပို VI Name			ပ		Щ
TRAJECTORY PARAMETERIZE Page Pag	TRAJECTORY GENERATE (Control Vector	')											
Spaine Control/Vectors collection) Page													
TRAJECTORY PARAMETERIZE Parameterize Parameter									public ControlVectorList(Collection extends</td <td>may not need, just data</td> <td></td> <td></td> <td></td>	may not need, just data			
X													
TRAJECTORY PARAMETERIZE CONSTRAINED STATE Trajectory/Param_enforceAccel.vi Trajectory/Param_enforceAccel.vi Trajectory/Param_enforceAccel.vi Trajectory/Param_enforceVelocity.vi Trajectory/Param_enforceVelocity.vi Trajectory/Param_enforceVelocity.vi Trajectory/Param_enforceVelocity.vi Trajectory/Param_enforceVelocity.vi Trajectory/Param_enforceVelocity.vi Trajectory/Param_timeParam.vi Dublic static Trajectory (List-PoseWith/Curvature> points. List-Trajectory (List-PoseWith/Curvature> points. List-Trajectory/Constraint> constraints, double end/Velocity/MetersPerSecond, double end/Velocity/MetersPerSecondSq. boolean reversed) TRAJECTORY PARAMETERIZE CONSTRAINED STATE TRAJECTORY PARAMETERIZE STATE STA						Execution Optimized	Test Routine	es VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
List-TrajectoryConstraint> constraints, ConstrainedState state) X X X No TrajectoryParam_enforceVelocity.vi TrajectoryParam_timeParam.vi TrajectoryParam_timeParam.vi public static Trajectory timeParametrizeTrajectory(List-PoseWithCurvature> points, List-TrajectoryOnstraints, double startVelocityMetersPerSecond, double maxVelocityMetersPerSecond, double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecond, double minAccelerationMetersPerSecond, double minAccelerationMetersPerSecond, double minAccelerationMetersPerSecond, double maxAccelerationMetersPerSecond, double maxAccelerationMetersPerSecondSq, double maxAccelerationMetersPerSecondSq, double	TRAJECTORY PARAMETERIZ	Ξ X	X	X	No	Execution Optimized	Test Routine	vi Name TrajectoryParam_calcStuffFwd.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
TrajectoryParam_enforceVelocity.vi X	TRAJECTORY PARAMETERIZ	X X	X	X	No No	Execution Optimized	Test Routine	VI Name TrajectoryParam_calcStuffFwd.vi TrajectoryParam_calcStuffRev.vi			Code Review	Test Program	Error Checking
TRAJECTORY PARAMETERIZE CONSTRAINED STATE X	TRAJECTORY PARAMETERIZ	X X	X	X	No No No	Execution Optimized	Test Routine	VI Name TrajectoryParam_calcStuffFwd.vi TrajectoryParam_calcStuffRev.vi TrajectoryParam_enforceAccel.vi	private static void enforceAccelerationLimits(boolean reverse,	This routines needs to be changed	Code Review	Test Program	Error Checking
TRAJECTORY PARAMETERIZE CONSTRAINED STATE X X X X X X X X X X X X X X X X X X X	TRAJECTORY PARAMETERIZ	X X X	X X	X	No No No	Execution Optimized	Test Routine	VI Name TrajectoryParam_calcStuffFwd.vi TrajectoryParam_calcStuffRev.vi TrajectoryParam_enforceAccel.vi TrajectoryParam_enforceVelocity.vi	private static void enforceAccelerationLimits(boolean reverse, List <trajectoryconstraint> constraints, ConstrainedState state)</trajectoryconstraint>	This routines needs to be changed when new constraints are added. This routines needs to be changed	Code Review	Test Program	Error Checking
distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double maxAccelerationMetersPerSecondSq, double maxAccelerationMetersPerSecondSq) X X X X X ConstrainedState SetMaxAccel.vi	TRAJECTORY PARAMETERIZ	X X X	X X X	X	No No No	Execution Optimized	Test Routine	VI Name TrajectoryParam_calcStuffFwd.vi TrajectoryParam_calcStuffRev.vi TrajectoryParam_enforceAccel.vi TrajectoryParam_enforceVelocity.vi	private static void enforceAccelerationLimits(boolean reverse, List <trajectoryconstraint> constraints, ConstrainedState state) public static Trajectory timeParameterizeTrajectory(List<posewithcurvature> points. List<trajectoryconstraint> constraints, double startVelocityMetersPerSecond, double endVelocityMetersPerSecond, double maxVelocityMetersPerSecond, double</trajectoryconstraint></posewithcurvature></trajectoryconstraint>	This routines needs to be changed when new constraints are added. This routines needs to be changed	Code Review	Test Program	Error Checking
X X X X ConstrainedState_SetMaxAccel.vi	TRAJECTORY PARAMETERIZ	X	X X X X	X	No No No No X	Optimized		VI Name TrajectoryParam_calcStuffFwd.vi TrajectoryParam_enforceAccel.vi TrajectoryParam_enforceVelocity.vi TrajectoryParam_timeParam.vi	private static void enforceAccelerationLimits(boolean reverse, List <trajectoryconstraint> constraints, ConstrainedState state) public static Trajectory timeParameterizeTrajectory(List<posewithcurvature> points. List<trajectoryconstraint> constraints, double startVelocityMetersPerSecond, double endVelocityMetersPerSecond, double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq, boolean reversed) Function Prototype</trajectoryconstraint></posewithcurvature></trajectoryconstraint>	This routines needs to be changed when new constraints are added. This routines needs to be changed when new constraints are added.	Code Review Code Review	Test Program	_
		X X X X X X X X X X	X X X X X X	X X X	No No No X	Optimized		VI Name TrajectoryParam_calcStuffFwd.vi TrajectoryParam_enforceAccel.vi TrajectoryParam_enforceVelocity.vi TrajectoryParam_timeParam.vi	private static void enforceAccelerationLimits(boolean reverse, List <trajectoryconstraint> constraints, ConstrainedState state) public static Trajectory timeParameterizeTrajectory(List<posewithcurvature> points. List<trajectoryconstraint> constraints, double startVelocityMetersPerSecond, double endVelocityMetersPerSecond, double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq, boolean reversed) Function Prototype ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double</trajectoryconstraint></posewithcurvature></trajectoryconstraint>	This routines needs to be changed when new constraints are added. This routines needs to be changed when new constraints are added.	Code Review	Test Program	_

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2.X 11/06/2022 – added various routines	LIST							_				
2.X 11/06/2022 – added various routines	Х	~	V	V			ConstrainedState SetVelAccel.vi					
	X		X	^ Y			ConstrainedState_SetVelocity.vi					
							Ooristramedotate_octvelooity.vi	ConstrainedState()				
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	E VI Name	V		de Review	st Program	or Checking
	Ĕ	Po	Š	Me	Ě	je L	VI Name	Function Prototype	Notes	Code	Test	Error
TRAJECTORY UTIL	X	Χ		Χ			TrajectoryUtil_fromPathWeaverJSON.vi	public static Trajectory fromPathweaverJson(Path path)				
	X	Χ		Χ			TrajectoryUtil_MakeWeightedWayPoint_ENG.vi					
	X	Χ	X	Χ	Χ		TrajectoryUtil_MakeWeightedWayPoint.vi					
	X	X		X			TrajectoryUtil_toPathWeaverJSON.vi	public static void toPathweaverJson(Trajectory trajectory, Path				
								path) public static Trajectory deserializeTrajectory(String json)				
								public static Trajectory deserialize Trajectory(String Json) public static String serializeTrajectory(Trajectory trajectory)				
TRAPEZOID PROFILE	X X X	X X Documented		X X Menu Item	Execution Optimized	Test Routine	VI Name TrapProfConstraint_New.vi TrapProfile_Calculate.vi TrapProfile_Direct.vi TrapProfile_Execute.vi	Function Prototype	Notes Private, remove from menu			
	X	X	X	X	SI		TrapProfile_Execute_AtGoal.vi					
	X	X		X X			TrapProfile_IsFinished.vi TrapProfile_New_DefInitial.vi					
	X	\hat{X}		X			TrapProfile_New.vi					
	X	\hat{X}		No			TrapProfile_ShouldFlipAcceleration.vi		Private, remove from menu			
	X	X		X			TrapProfile_TimeLeftUntil.vi		Filvate, remove nom menu			
	X	X		X			TrapProfile_TrineLenonui.vi					
	X	\overline{X}		X			TrapProfState Equals.vi					
	X	X		Χ			TrapProfState New.vi					
										J		
===== ORY CONSTRAINT =====					nized							
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optin		S VI Name	Function Prototype	Notes			
CENTRIPETAL ACCELERATION CONSTRAINT	X	Χ		X			CentripetalAccelConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d				
								poseMeters, double curvatureRadPerMeter, double				
	X	X		X			CentripetalAccelConstraint_getMinMaxAccel.vi	velocityMetersPerSecond) public MinMax				
	^	^		^			OSTATIPOLATACOCIO OTISTI AITIL _ YOLIVIII IIVIAAAACCEI. VI	getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters	s.			
								getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters double curvatureRadPerMeter, double velocityMetersPerSecond)			
	X	X		X	SI		CentripetalAccelConstraint_New.vi	public CentripetalAccelerationConstraint(double	Can use cluster pack for now			
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	E VI Name	maxCentripetalAccelerationMetersPerSecondSq) Function Prototype	Notes	I		

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TRAJECTORY CONSTRAINT

2022 – added various routines									
DIFF DRIVE KINEMATIC CONSTRAINT	X	X		X			DiffDriveKinematicsConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X			DiffDriveKinematicsConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	Х	X		X	SI		DiffDriveKinematicsConstraint_New.vi	public DifferentialDriveKinematicsConstraint(final DifferentialDriveKinematics kinematics, double maxSpeedMetersPerSecond)	
	ented	ented	нг	,em	on Optimized	outine	Sample Program		
	Implementea	Documented	Not WPILIB	Menu Item	Execution	Test Routine	S VI Name	Function Prototype	Notes
DIFF DRIVE VOLTAGE CONSTRAINT	X	X		X			DiffDriveVoltageConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		Х			DiffDriveVoltageConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X	SI		DiffDriveVoltageConstraint_New.vi	public DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	
ELLIPTICAL REGION CONSTRAINT	X X Implemented	X X Documented	Not WPILIB	X X Wenu Item	Execution Optimized	Test Routine	VI Name EllipRegionConstraint_getMaxVelocity.vi EllipRegionConstraint_getMinMaxAccel.vi EllipRegionConstraint_lsPoseInRegion.vi EllipRegionConstraint_New.vi	Function Prototype	Notes
JERK CONSTRAINT	/ / Implemented	Documented	X X Not WPILIB	Menu Item	S Execution Optimized	Test Routine	VI Name JerkConstraint_getMaxVelocity.vi JerkConstraint_getMinMaxAccel.vi JerkConstraint_New.vi	Routine exists, it is just a shell Routine exists, it is just a shell	Notes FUTURE FUTURE FUTURE FUTURE
MAX VELOCITY CONSTRAINT	X X Implemented	X X Documented	Not WPILIB	X Menu Item	ର ଓ ର Execution Optimized	Test Routine	VI Name MaxVelocityConstraint_getMaxVelocity.vi MaxVelocityConstraint_getMinMaxAccel.vi MaxVelocityConstraint_New.vi	Function Prototype	Notes

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11/06/2022 – added various routines									-	
1 1/00/2022 added various routiles					ā					
MECANUM DRIVE KINEMATICS CONSTRAINT	X X Implemented	X X Documented	Not WPILIB	X X Menu Item	ত Execution Optimized	Test Routine	Sample Program	VI Name MecaDriveKinematicsConstraint_getMaxVelocity.vi MecaDriveKinematicsConstraint_getMinMaxAccel.vi MecaDriveKinematicsConstraint_New.vi	Function Prototype	Notes
					~					
RECTANGULAR REGION CONSTRAINT [X Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name RectRegionConstraint_getRectRegion.vi	Function Prototype	Notes
	Χ	X		X				RectRegionConstraint_getMinMaxAccel.vi		
	X	X		X				RectRegionConstraint_IsPoseInRegion.vi		
	X	X		X				RectRegionConstraint_New.vi		
L			l			l		r teeti tegieri eeristi airit_i tew.vi		
SWERVE DRIVE KINEMATICS CONSTRAINT	X Implemented	X Documented	Not WPILIB	X Menu Item	ত্ৰ Execution Optimized	Test Routine		VI Name SwerveDriveKinematicsConstraint_getMaxVelocity.vi SwerveDriveKinematicsConstraint_getMinMaxAccel.vi SwerveDriveKinematicsConstraint_New.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	Notes Can use cluster pack for now
	^	^		^	31			SwerveDriveRinematicsConstraint_INew.vi	SwerveDriveKinematics kinematics, double	Can use cluster pack for now
									maxSpeedMetersPerSecond)	
TRAJECTORY CONSTRAINT	Implemented $X \mid X \mid$ Implemented	Documented X X Documented	Not WPILIB X X Not WPILIB	Menu Item X X X Menu Item	Execution Optimized Execution Optimized	Test Routine Test Routine	mple Program	VI Name TrajConstraint_GetMaxVelocity.vi TrajConstraint_GetMinMaxAccel.vi TrajConstraint_GetType.vi	Function Prototype	Notes
			Ž			<u> </u>	Ŋ	VI Name		Notes
TRAJECTORY CONSTRAINT (Min Max)	Χ	Χ		X	SI			Constraint_MinMax_New.vi	Constraint_MinMax_New	
	Χ	X		X	SI			Constraint_MinMax_NewMinMax.VI	Constraint_MinMax_New	

'========= UTILITY

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

FRC_LabVIEW_Trajectory_Library_Routines.xlsx

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
UTIL	X	Χ	Χ	X	SI			Util ApproxEqual.vi		
	Χ	Χ	X	X				Util_Array_PoseWCurv_to_XY.vi		
	Χ	Χ	X	X	SI			Util_CalcDist.vi		
	Χ	Χ	X	X	SI			Util_GetLibraryVersion.vi		
	Χ	Χ	X	X	SI			Util_GetLibUsage.vi		
	Χ	Χ	X	X				Util_GetTime.vi		Once tested completely, this should be optimized!
•	Χ	Χ	Χ	No	N/A			Util_LibraryGlobals.vi		Global Variables – no block diag.
	Χ	Χ	X	X				Util Trajectory Absolute To Relative.vi		ű
	Χ	Χ	Χ	X				Util Trajectory ReadFile.vi		
•	Χ	Χ	Χ	X				Util_Trajectory_to_XY.vi		
	Χ	Χ	Χ	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	X	X	X				Util_Trajectory_WriteFile_Pathweaver.vi		
	Χ	Χ	Χ	No				Util_Trajectory_WriteFile_States.vi		internal
	Χ	Χ	Χ	No				Util_Trajectory_WriteFile_WayPoints.vi		internal
	Χ	Χ	Χ	X				Util_Trajectory_WriteFile.vi		
	Χ	Χ	Χ	X				Util_TrajectoryState_Meters_To_Inches.vi		
	Χ	Χ	X	X				Util_TrajState_to_DiffDrive_WheelPos.vi		
	Χ	Χ	Χ	X				Util_DispWaypoint_Eng_To_SI.vi		
	Χ	Χ	Χ	X				Util_DispWaypoint_To_CubicInput.vi		
	Χ	Χ	X	X				Util_DispWaypoint_To_QuinticInput.vi		
	Χ	Χ	X	X				Util_DispWeightedWaypiont_Eng_To_WeightedWaypoint		
	X	Χ	X	No				Util_DispWeightedWayPoint_To_WeightedWayPoint.vi		Sorry about the confusing name

'======= CONVERSIONS '========

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimize	Test Routine	Sample Program	VI Name	Function Prototype	Notes
CONV	Χ	Χ	Χ	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	Χ	Χ	SI			Conv_Deg_Radians.vi		
	Χ	Χ	X	Χ	SI			Conv_Deg_Rotations.vi		
	Χ	Χ	X	Χ	SI			Conv_Feet_Meters.vi		
	Χ	Χ	X	Χ	SI			Conv_GyroDegrees_Heading.vi		
	Χ	Χ	Χ	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	X	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	X	X	X	SI			Conv Yards Meters.vi		

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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	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	Χ		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		
	Χ	Χ		Χ	SI			Units_RotationsPerMinuteToRadiansPerSecond.vi		
	Χ	Χ		Χ	SI			Units_RotationsToDegrees.vi		
	Χ	Χ		Χ	SI			Units_RotationsToRadians.vi		
	X	X		X	SI			Units_SecondsToMilliseconds.vi		

'========= PATHFINDER UTIL '========

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

Function Prototype Notes PathfinderUtil_Continuous_Heading_Difference.vi
PathfinderUtil_OptimizeTrajectoryStates.vi
PathfinderUtil_ToTrajectory.vi
PathfinderUtil_ToTrajectoryStates.vi

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	 VI Name Function Prototype	Notes	Code Review	Test Program	Error Checking
DC MOTOR	Χ	Χ		Χ	SI		DCMotor_GetAndymark9015.vi				
	Χ	Χ		Χ	SI		DCMotor_GetAndymarkRs775_125.vi				
	X	Χ		Χ	SI		DCMotor_GetBag.vi				
	Χ	Χ		Χ	SI		DCMotor_GetBanebotsRs550.vi				
	Χ	Χ		Χ	SI		DCMotor_GetBanebotsRs775.vi				
	Χ	Χ		Χ	SI		DCMotor_GetCIM.vi				
	X	Χ		Χ	SI		DCMotor_GetCurrent.vi				
	Χ	Χ		Χ	SI		DCMotor_GetFalcon500.vi				
	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				
	X	Χ		Χ	SI		DCMotor_GetVex775Pro.vi				
	Χ	X		Χ	SI		DCMotor_New.vi				

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

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

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

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

11/06/2022 – added various routines											
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			_ ≥		Щ			Notes	ၓ		Ē
KALMAN FILTER				X		X	KalmanFilter_Correct.vi				
	X			X			KalmanFilter_GetK				
	X	X		X			KalmanFilter_GetK_Single.vi				
	X	X		X			KalmanFilter_GetXHat				
	X	X		X		Χ	KalmanFilter_GetXHaT_Single				
	X	X		X		Χ	KalmanFilter_New.vi				
	X	X		X		X	KalmanFilter_Predict.vi				
	X	X		X			KalmanFilter_Reset.vi				
	X	X		X			KalmanFilter_SetXHat				
	X	X		X		X	KalmanFilter_SetXHat_Single				
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	<u>=</u>		8	Menu	Execution	<u>1</u>	ชื่อ เมื่อ VI Name Function Prototype	Notes	රි	Test	Error
KALMAN FILTER LATENCY COMPENSATOR	X	X		X			KalmanFilterLatencyComp_AddObserverState.vi				
	X	X		X			KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi				
	X	X		X			KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.vi				
	X	X		X			KalmanFilterLatencyComp_FindClosestMeasurement.vi				
	X			X			KalmanFilterLatencyComp_New.vi				
	X	X		X			KalmanFilterLatencyComp_Observer_New.vi				
	X	X		X			KalmanFilterLatencyComp_Reset.vi				
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	ďμ	Documente	Not WPILIB	Menu Item	Execution	Test Routine	ชื่อ อุโม ชับ VI Name Function Prototype	Notes	Code Reviev	est Program	ori:
MECANUM DRIVE POSE ESTIMATOR		<u> </u>	_<	_ <		_	MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi	Notes			Ш
MEGANOM DRIVE FOSE ESTIMATOR		X		X			MecaDrivePoseEst_AddVisionMeasurement.vi			 	
	X	X		$\frac{\lambda}{X}$			MecaDrivePoseEst GetEstimatedPosition.vi				
	X			No			MecaDriveFoseEst_GeteStilinatedFostitoff.vi MecaDriveFoseEst_Kalman_F_Callback.vi				
	X	X		No			MecaDrivePoseEst Kalman H Callback.vi				
	X			X			MecaDrivePoseEst_New.vi				
	X			X			MecaDrivePoseEst ResetPosition.vi				
	X	X		X			MecaDrivePoseEst SetVisionMeasurementStdDevs.vi				
	X	X		X			MecaDrivePoseEst_Update.vi				
	X			X			MecaDrivePoseEst_UpdateWithTime.vi				
	X	X		No			MecaDrivePoseEst VisionCorrect Callback.vi				
	X			No			MecaDrivePoseEst VisionCorrect Kalman H Callback.vi				
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SWERVE DRIVE POSE ESTIMATOR	==	<u> </u>	_ <	_ ≥	Щ	_	VI Name Function Prototype SwerveDrivePoseEst AddVisionMeasurement StdDev.vi	INULES	U	<u> </u>	Ш
SVALIVAL DIVIAL LOSE ESTIMATOR		1					OWOLVODING GOELOL MUNICIONINICADUICHICH CIUDEN.VI	The state of the s	1	1	

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

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

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

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

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

routines					
LINEAR SYSTEM	X	X	Χ	- 1	LinearSystem_CalculateX.vi

EM	X	X	X	- 1	LinearSystem_CalculateX.vi		
	X	Χ	X	- 1	LinearSystem_CalculateY.vi		
	X	X	X	SI	LinearSystem_GetA.vi		
	X	X	X	SI	LinearSystem_GetAElement.vi		
	X	X	X	SI	LinearSystem_GetB.vi		
	X	X	X	SI	LinearSystem_GetBElement.vi		
	X	Χ	X	SI	LinearSystem_GetC.vi		
	X	X	X	SI	LinearSystem_GetCElement.vi		
	X	X	X	SI	LinearSystem_GetD.vi		
	X	X	X	SI	LinearSystem_GetD.vi LinearSystem_GetDElement.vi		
	X	Χ	X	SI	LinearSystem_New.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program				Code Review	Test Program	Error Checking
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LINEAR SYSTEM LOOP	Χ	X		X				LinearSystemLoop_ClampInput.vi					
	Χ	X		X				LinearSystemLoop_Correct.vi					
								LinearSystemLoop_GetClampFunction.vi					
	X	X		X				LinearSystemLoop_GetController.vi					
	Χ	X		X				LinearSystemLoop_GetError_Single.vi					
	Χ	X		X				LinearSystemLoop_GetError.vi					
	Χ	Χ		X				LinearSystemLoop_GetFeedForward.vi					
	Χ	Χ		X				LinearSystemLoop_GetNextR_Single.vi					
	Χ	Χ		X				LinearSystemLoop_GetNextR.vi					
	Χ	Χ		X				LinearSystemLoop GetObserver.vi					
	Χ	Χ		X				LinearSystemLoop_GetU_Row.vi					
	Χ	Χ		X				LinearSystemLoop_GetU.vi					
	Χ	X		X				LinearSystemLoop_GetXHat_Single.vi					
	Χ	Χ		X				LinearSystemLoop GetXHat.vi					
								LinearSystemLoop_New_BBB					
								LinearSystemLoop_New_LinearSystem_ClampFunc					
	Χ	X		X				LinearSystemLoop New LinearSystem ClampVal.vi					
	Χ	X		X				LinearSystemLoop New.vi					
	Χ	X		X				LinearSystemLoop Predict.vi					
	Χ	X		X				LinearSystemLoop_Reset.vi					
								LinearSystemLoop_SetClampFunction.vi					
								LinearSystemLoop SetNextR Some.vi					
	Χ	X		X				LinearSystemLoop SetNextR.vi					
								LinearSystemLoop SetXHat Single.vi					
								LinearSystemLoop_SetXHat.vi					
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LTV DIFFERENTIAL DRIVE CONTROLLE

	Implen	Docum	Not WI	Menu I	Execut	Test R	Sampli	VI Name	Function Prototype	Notes	Code F	Test P	Error C
LER	Χ	Χ		Χ				LTVDiffDriveCtrl_Calculate.vi					
	Χ	Χ		Χ				LTVDiffDriveCtrl_New.vi					
	Χ	Χ		Χ				LTVDiffDriveCtrl_Calculate_TrajState.vi					
	Χ	X		Χ				LTVDiffDriveCtrl_Calculate_SetTolerance.vi					
	Χ	Χ		Χ				LTVDiffDriveCtrl_Calculate_AtReference.vi					

 added various routines 												
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimizea	Test Routine	Nample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
LTV UNICYCLE CONTROLLER	Χ	Χ		Χ		Χ	LTVUnicycleCtrl_AtReference.vi					
	Χ	Χ		Χ		Χ	LTVUnicycleCtrl_Calculate_TrajState.vi					
	Χ	Χ		Χ		Χ	LTVUnicycleCtrl_Calculate.vi					
	Χ	Χ		Χ		Χ	LTVUnicycleCtrl_New.vi					
	Χ	X		Χ		Χ	LTVUnicycleCtrl_SetEnabled.vi					
	Χ	X		Χ		Χ	LTVUnicycleCtrl_SetTolerance.vi					

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

	Implemented	Documented		Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
ALLBACK HELPER	X	X		(CallbackHelp_MatrixMinus.vi				'	
	X	X					CallbackHelp_MatrixMult_CoerceSizeB.vi				· '	
	X	X					CallbackHelp_MatrixMult.vi					
	X	X	()	(CallbackHelp_MatrixPlus.vi					
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DISCRETIZATION		X		(X		Discretization_DiscretizeA.vi				<u> </u>	
		X		(X		Discretization_DiscretizeAB.vi				<u> </u>	
		Χ		(X		Discretization_DiscretizeABTaylor.vi				'	
		X		(X		Discretization_DiscretizeAQ.vi				<u> </u>	
		X		(Χ		Discretization_DiscretizeAQTaylor.vi				<u> </u>	
	X	X		(Discretization_DiscretizeR.vi				<u> </u>	
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TATE SPACE UTIL	X	X	()	0	Test F	Sam	StateSpaceUtil_Check_Stabalizable.vi	Function Prototype	Internal routine	S .		
TATE SPACE UTIL	X	X X	()	0	Test F	Sam	StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi	Function Prototype		O		
TATE SPACE UTIL	X X X	X X X X	(N	0	Test F	Samı	StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi StateSpaceUtil_IsDetectable.vi	Function Prototype	Internal routine	O		
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TATE SPACE UTIL	X X X X	X X X X X X			X		StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi StateSpaceUtil_IsDetectable.vi StateSpaceUtil_IsStabalizable.vi StateSpaceUtil_MakeCostMatrix.vi	Function Prototype	Internal routine	O		
TATE SPACE UTIL	X X X X X	X					StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi StateSpaceUtil_IsDetectable.vi StateSpaceUtil_IsStabalizable.vi StateSpaceUtil_MakeCostMatrix.vi StateSpaceUtil_MakeCovarianceMatrix.vi	Function Prototype	Internal routine	O		
TATE SPACE UTIL	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		StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi StateSpaceUtil_IsDetectable.vi StateSpaceUtil_IsStabalizable.vi StateSpaceUtil_MakeCostMatrix.vi StateSpaceUtil_MakeCovarianceMatrix.vi StateSpaceUtil_MakeWhiteNoiseVector.vi	Function Prototype	Internal routine	O		
TATE SPACE UTIL	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		StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi StateSpaceUtil_IsDetectable.vi StateSpaceUtil_IsStabalizable.vi StateSpaceUtil_MakeCostMatrix.vi StateSpaceUtil_MakeCovarianceMatrix.vi StateSpaceUtil_MakeWhiteNoiseVector.vi StateSpaceUtil_NomalizeInputVector.vi	Function Prototype	Internal routine	O		
TATE SPACE UTIL	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		StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi StateSpaceUtil_IsDetectable.vi StateSpaceUtil_IsStabalizable.vi StateSpaceUtil_MakeCostMatrix.vi StateSpaceUtil_MakeCovarianceMatrix.vi StateSpaceUtil_MakeWhiteNoiseVector.vi StateSpaceUtil_NomalizeInputVector.vi StateSpaceUtil_PoseTo3dVector.vi	Function Prototype	Internal routine	O		
TATE SPACE UTIL	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		StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi StateSpaceUtil_IsDetectable.vi StateSpaceUtil_IsStabalizable.vi StateSpaceUtil_MakeCostMatrix.vi StateSpaceUtil_MakeCovarianceMatrix.vi StateSpaceUtil_MakeWhiteNoiseVector.vi StateSpaceUtil_NomalizeInputVector.vi	Function Prototype	Internal routine	O		

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BATTERY SIN		Χ		X	SI		BatterySim_CalculateDefaultBatteryLoadedVoltage.vi					
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		X		X		+	DCMotorSim_getAngularVelocityRadPerSec.vi					
		\hat{X}		X		+	DCMotorSim_getAngularVelocityRPM.vi					
		X		X		+	DCMotorSim_GetCurrentDrawAmps.vi					
		X		×			DCMotorSim New MOI.vi					
		Χ		X			DCMotorSim_New_Plant.vi					
	X	Χ		X			DCMotorSim_SetInputVoltage.vi					
	X	Χ)	X			DCMotorSim_Update.vi					
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DIFFERENTIAL DRIVE TRAIN SIN	X X X	X X X))	Χ Χ Χ	Execution Optimized	Morrood olumo	VI Name DiffDriveTrainSim_ClampInput.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
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DIFFERENTIAL DRIVE TRAIN SIM	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 Test Routine	O Drown	VI Name DiffDriveTrainSim_ClampInput.vi DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi DiffDriveTrainSim_CreateKitbotSim.vi DiffDriveTrainSim_GetCurrentDrawAmps.vi DiffDriveTrainSim_GetCurrentGearing.vi DiffDriveTrainSim_GetDynamics.vi DiffDriveTrainSim_GetHeading.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
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DIFFERENTIAL DRIVE TRAIN SIM	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 Test Routine	on on one	VI Name DiffDriveTrainSim_ClampInput.vi DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi DiffDriveTrainSim_CreateKitbotSim.vi DiffDriveTrainSim_GetCurrentDrawAmps.vi DiffDriveTrainSim_GetCurrentGearing.vi DiffDriveTrainSim_GetDynamics.vi DiffDriveTrainSim_GetHeading.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftPositionMeters.vi DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi DiffDriveTrainSim_GetOutput_Single.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE TRAIN SIN	X X X X X X X X X X X X X X X X X X X	X		X	Execution Optimized Test Routine	Months Division	DiffDriveTrainSim_ClampInput.vi DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi DiffDriveTrainSim_CreateKitbotSim.vi DiffDriveTrainSim_GetCurrentDrawAmps.vi DiffDriveTrainSim_GetCurrentGearing.vi DiffDriveTrainSim_GetDynamics.vi DiffDriveTrainSim_GetHeading.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftPositionMeters.vi DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi DiffDriveTrainSim_GetOutput_Single.vi DiffDriveTrainSim_GetPose.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE TRAIN SIN	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 Test Routine	Samula Diraces	VI Name DiffDriveTrainSim_ClampInput.vi DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi DiffDriveTrainSim_CreateKitbotSim.vi DiffDriveTrainSim_GetCurrentDrawAmps.vi DiffDriveTrainSim_GetCurrentGearing.vi DiffDriveTrainSim_GetDynamics.vi DiffDriveTrainSim_GetHeading.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftPositionMeters.vi DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi DiffDriveTrainSim_GetOutput_Single.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE TRAIN SIN	X X X X X X X X X X X X X X X X X X X	X			Execution Optimized Test Routine	monard Drown	DiffDriveTrainSim_ClampInput.vi DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi DiffDriveTrainSim_CreateKitbotSim.vi DiffDriveTrainSim_GetCurrentDrawAmps.vi DiffDriveTrainSim_GetCurrentGearing.vi DiffDriveTrainSim_GetDynamics.vi DiffDriveTrainSim_GetHeading.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftPositionMeters.vi DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi DiffDriveTrainSim_GetOutput_Single.vi DiffDriveTrainSim_GetPose.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE TRAIN SIN	X X X X X X X X X X X X X X X X X X X	X		XX	Execution Optimized Test Routine	memory Drown	DiffDriveTrainSim_ClampInput.vi DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi DiffDriveTrainSim_CreateKitbotSim.vi DiffDriveTrainSim_GetCurrentDrawAmps.vi DiffDriveTrainSim_GetCurrentGearing.vi DiffDriveTrainSim_GetDynamics.vi DiffDriveTrainSim_GetHeading.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi DiffDriveTrainSim_GetOutput_Single.vi DiffDriveTrainSim_GetPose.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi DiffDriveTrainSim_GetState_Single.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE TRAIN SIN	X X X X X X X X X X X X X X X X X X X	X		XX	Execution Optimized Test Routine	O mulo Drowen	DiffDriveTrainSim_ClampInput.vi DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi DiffDriveTrainSim_CreateKitbotSim.vi DiffDriveTrainSim_GetCurrentDrawAmps.vi DiffDriveTrainSim_GetCurrentGearing.vi DiffDriveTrainSim_GetDynamics.vi DiffDriveTrainSim_GetHeading.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftPositionMeters.vi DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi DiffDriveTrainSim_GetOutput_Single.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi DiffDriveTrainSim_GetState_Single.vi DiffDriveTrainSim_GetState_Single.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE TRAIN SIN	X X X X X X X X X X X X X X X X X X X	X		XX	Execution Optimized Test Routine	Comple Brown	DiffDriveTrainSim_ClampInput.vi DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi DiffDriveTrainSim_CreateKitbotSim.vi DiffDriveTrainSim_GetCurrentDrawAmps.vi DiffDriveTrainSim_GetCurrentGearing.vi DiffDriveTrainSim_GetDynamics.vi DiffDriveTrainSim_GetHeading.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftPositionMeters.vi DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi DiffDriveTrainSim_GetOutput_Single.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi DiffDriveTrainSim_GetState_Single.vi DiffDriveTrainSim_GetState_Single.vi DiffDriveTrainSim_GetState.vi DiffDriveTrainSim_GetState.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE TRAIN SIN	X X X X X X X X X X X X X X X X X X X	X		XX	Execution Optimized Test Routine	O mala Brows	DiffDriveTrainSim_ClampInput.vi DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi DiffDriveTrainSim_CreateKitbotSim.vi DiffDriveTrainSim_GetCurrentDrawAmps.vi DiffDriveTrainSim_GetCurrentGearing.vi DiffDriveTrainSim_GetDynamics.vi DiffDriveTrainSim_GetHeading.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftPositionMeters.vi DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi DiffDriveTrainSim_GetOutput_Single.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi DiffDriveTrainSim_GetState_Single.vi DiffDriveTrainSim_GetState_Single.vi DiffDriveTrainSim_GetState.vi DiffDriveTrainSim_KitBotWheelSize.vi DiffDriveTrainSim_New_Mass_MOI.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE TRAIN SIN	X X X X X X X X X X X X X X X X X X X	X		XX	Execution Optimized Test Routine	O mala Brown	DiffDriveTrainSim_ClampInput.vi DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi DiffDriveTrainSim_CreateKitbotSim.vi DiffDriveTrainSim_GetCurrentDrawAmps.vi DiffDriveTrainSim_GetCurrentGearing.vi DiffDriveTrainSim_GetDynamics.vi DiffDriveTrainSim_GetHeading.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftPositionMeters.vi DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi DiffDriveTrainSim_GetOutput_Single.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi DiffDriveTrainSim_GetState_Single.vi DiffDriveTrainSim_GetState_Single.vi DiffDriveTrainSim_GetState.vi DiffDriveTrainSim_KitBotWheelSize.vi DiffDriveTrainSim_New_Mass_MOI.vi DiffDriveTrainSim_New.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE TRAIN SIN	X X X X X X X X X X X X X X X X X X X	X		XX	Execution Optimized Test Routine	O mario Dio ocean	DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi DiffDriveTrainSim_CreateKitbotSim.vi DiffDriveTrainSim_GetCurrentDrawAmps.vi DiffDriveTrainSim_GetCurrentGearing.vi DiffDriveTrainSim_GetDynamics.vi DiffDriveTrainSim_GetHeading.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftPositionMeters.vi DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi DiffDriveTrainSim_GetOutput_Single.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi DiffDriveTrainSim_GetState_Single.vi DiffDriveTrainSim_GetState_vi DiffDriveTrainSim_GetState.vi DiffDriveTrainSim_KitBotWheelSize.vi DiffDriveTrainSim_New_Mass_MOI.vi DiffDriveTrainSim_New.vi DiffDriveTrainSim_SetCurrentGearing.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE TRAIN SIN	X X X X X X X X X X X X X X X X X X X	X		XX	Execution Optimized Test Routine	mesocade process	DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi DiffDriveTrainSim_CreateKitbotSim.vi DiffDriveTrainSim_GetCurrentDrawAmps.vi DiffDriveTrainSim_GetCurrentGearing.vi DiffDriveTrainSim_GetDynamics.vi DiffDriveTrainSim_GetHeading.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftPositionMeters.vi DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi DiffDriveTrainSim_GetOutput_Single.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi DiffDriveTrainSim_GetState_Single.vi DiffDriveTrainSim_GetState_vi DiffDriveTrainSim_GetState.vi DiffDriveTrainSim_KitBotWheelSize.vi DiffDriveTrainSim_New_Mass_MOI.vi DiffDriveTrainSim_New_Mass_MOI.vi DiffDriveTrainSim_SetCurrentGearing.vi DiffDriveTrainSim_SetCurrentGearing.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE TRAIN SIN	X X X X X X X X X X X X X X X X X X X	X		XX	Execution Optimized Test Routine	monoral Drawes	DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi DiffDriveTrainSim_CreateKitbotSim.vi DiffDriveTrainSim_GetCurrentDrawAmps.vi DiffDriveTrainSim_GetCurrentGearing.vi DiffDriveTrainSim_GetDynamics.vi DiffDriveTrainSim_GetHeading.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftPositionMeters.vi DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi DiffDriveTrainSim_GetOutput_Single.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi DiffDriveTrainSim_GetState_Single.vi DiffDriveTrainSim_GetState.vi DiffDriveTrainSim_GetState.vi DiffDriveTrainSim_KitBotWheelSize.vi DiffDriveTrainSim_New_Mass_MOI.vi DiffDriveTrainSim_New.vi DiffDriveTrainSim_SetCurrentGearing.vi DiffDriveTrainSim_SetCurrentGearing.vi DiffDriveTrainSim_SetPose.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE TRAIN SIN	X X X X X X X X X X X X X X X X X X X	X		XX	Execution Optimized Test Routine	monoral Dronger	DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi DiffDriveTrainSim_CreateKitbotSim.vi DiffDriveTrainSim_GetCurrentDrawAmps.vi DiffDriveTrainSim_GetCurrentGearing.vi DiffDriveTrainSim_GetDynamics.vi DiffDriveTrainSim_GetHeading.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftPositionMeters.vi DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi DiffDriveTrainSim_GetOutput_Single.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi DiffDriveTrainSim_GetState_Single.vi DiffDriveTrainSim_GetState_vi DiffDriveTrainSim_GetState.vi DiffDriveTrainSim_KitBotWheelSize.vi DiffDriveTrainSim_New_Mass_MOI.vi DiffDriveTrainSim_New_Mass_MOI.vi DiffDriveTrainSim_SetCurrentGearing.vi DiffDriveTrainSim_SetCurrentGearing.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking

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Code Review	Test Program	Error Checking
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X	Χ	No		LinearSystemSim_UpdateX.vi			
X	XX	No		LinearSystemSim_UpdateY.vi			

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

'======== MATRIX UTILITIES

> Function Prototype Notes MatBuilder_Create.vi
> MatBuilder_Fill.vi MAT BUILDER X X X SI X SI XX

	. Implemented	. Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATRIX	X	X		X	SI			Matrix_AssignBlock.vi					
	Χ	X		X	SI			Matrix_Block.vi					
				\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	0,			Matrix_ChangeBoundsUnchecked.vi					
	X	X		X	SI			Matrix_Create.vi					
								Matrix_Det.vi					
	Χ	X		X	SI			Matrix_Diag.vi					
								Matrix_Div_Scalar.vi		labview has function			
								Matrix_ElementPower.vi					
	Χ	X		X	SI			Matrix_ElementSum.vi					
								Matrix_ElementTimes.vi					
								Matrix_Equals.vi					
	Χ	X		X	1			Matrix_Exp.vi					
	Χ	X		X	SI			Matrix_ExtractColumnVector.vi					
	Χ	X		X	SI			Matrix_ExtractFrom.vi					
								Matrix_ExtractMatrix.vi					
	Χ	Χ		X	SI			Matrix_ExtractRowVector.vi					
	Χ	Χ		X	SI			Matrix_Fill.vi					
								Matrix_Get.vi		labview has function			

- vi implementation	LISI							_				
us routines	X	V		Χ	,		Matrix Ident.vi		WDILIP calls this EVE			
	X	Χ		X	- 1				WPILIB calls this EYE			
		· ·			01		Matrix_Inv.vi					
	X	X		Χ	SI		Matrix_IsEqual.vi					
							Matrix_IsIdentical.vi					
	X	Χ		Χ	1		Matrix_LLTDecompose.vi					
							Matrix_Max.vi					
							Matrix_MaxAbs.vi					
							Matrix_Mean.vi					
							Matrix_MinInternal.vi					
							Matrix_Minus_Matrix.vi					
							Matrix_Minus_Scalar.vi					
	X	X		Χ	- 1		Matrix_NormF.vi					
							Matrix NormIndP1.vi					
							Matrix_Plus_Matrix.vi					
							Matrix_Plus_Scalar.vi					
	X	X		X	1		Matrix Pow.vi		THIS NEEDS WORK!!!!			
	X	X		X	SI		Matrix_SetColumn.vi		THIS NEEDS WORKEN			
	X	X		X	SI		Matrix_SetRow.vi	THERE ARE LOTS OF OTHER MATRIX FUNCTIONS THAT				
	_ ^	^		^	31		IVIALITX_SELROW.VI	SHOULD BE INCLUDED HERE FOR ISOLATION.				
							Matrix Solve.vi	GHOOLD BE INCLUDED HERE I OR ISOLATION.				
							Matrix Times Matrix.vi					
							Matrix_Times_Scalar.vi					
							Matrix Trace.vi					
	X	V		X	SI							
		X			SI		Matrix_Transpose.vi					
	X	X	Χ	Χ			Matrix_WithinTolerance.vi					
SIMPLE MATRIX	X Implemented	X Documented	Not WPILIB	X Menu Item	ত্ৰ Execution Optimized	Test Routine	SimpleMatrix_ExtractMatrix.vi	Function Prototype	Notes NOTE Matrix also has an ExtractMatrix with different calling parameters YUK.	Code Review	Test Program	Error Checking
MATRIX HELPER	X Implemented	X Documented	X Not WPILIB	X Menu Item	ত Execution Optimized	Test Routine	E ย่อง อัน อัน VI Name MatrixHelper_CooerceSize.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	X	Χ	Χ	X	SI		MatrixHelper_MultCooerceBSize.vi					
	X	Χ	Χ	Χ	SI		MatrixHelper_Zero.vi					
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	ample Program		Marie	Code Review	Test Program	Error Checking
			_ <u>×</u> _				ν VI Name	Function Prototype	Notes	ŭ	74	<u> </u>
VECTOR BUILDER	X	Χ		Χ	SI		VecBuilder_1x1Fill.vi					
				Χ	C/		MacDuilden OutFiller					
	X	Χ		_^_	SI		VecBuilder_2x1Fill.vi					
		Χ		Χ	SI		VecBuilder_3x1Fill.vi					
	X			X	SI SI							
	X X X	X		X	SI SI		VecBuilder_3x1Fill.vi VecBuilder_4x1Fill.vi					
· · · · · · · · · · · · · · · · · · ·	X X X	X X X		X X X	SI SI SI		VecBuilder_3x1Fill.vi VecBuilder_4x1Fill.vi VecBuilder_5x1Fill.vi					
	X X X	X		X	SI SI		VecBuilder_3x1Fill.vi VecBuilder_4x1Fill.vi					

X	X		X SI	VecBuilder_8x1Fill.vi			
				VecBuilder_9x1Fill.vi			
				VecBuilder_10x1Fill.vi			
X	X	X	X SI	VecBuilder_ArrayBy1Fill.vi			

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

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MATH '======

ANGLE STATISTICS		X Documented	X Not WPILIB	X Menu Item		Test Routine	E E E E E E E E E E E E E E E E E E E	Function Prototype	Notes	Code Review	Test Program	Error Checking
	X X X	X X X	X	X	X		AngleStats_AngleAdd.vi AngleStats_AngleMean_CallbackHelp.vi AngleStats_AngleMean.vi					
	X	X	X	X	X I	X	AngleStats_AngleResidual_CallbackHelp.vi AngleStats_AngleResidual.vi					
MATH UTILITY	X X Implemented	X X X X X X X X X X X X X X X X X X X	Not WPILIB	X X X X X X X	SI SI	Test Routine	VI Name MathUtil_AngleModulus.vi MathUtil_ApplyDeadband.vi MathUtil_Clamp_Int.vi MathUtil_Clamp.vi MathUtil_InputModulus.vi MathUtil_Interpolate.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
MERWE SCALED SIGMA POINTS	X Implemented	X Documented	Not WPILIB	X Menu Item	- Execution Optimized	Test Routine	English Solution of the state o	Function Prototype	Notes	Code Review	Test Program	Error Checking
MENTE COALLY CIONA POINTS	Χ	Χ		X	SI		MerweScSigPts GetNumSigmas.vi					
	X	X		X		_	MerweScSigPts_GetWc_Single.vi					
	X	X		X	51	1	MerweScSigPts_GetWc.vi					
		X		X	SI		MerweScSigPts GetWm Single vi			1	1	1
	X	X		X	SI		MerweScSigPts_GetWm_Single.vi MerweScSigPts_GetWm.vi					

 added various routines 													
	X	X		Χ	1			MerweScSigPts_New.vi					
	Χ	X		X	1			MerweScSigPts_SigmaPoints.vi					
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program				Review	Test Program	Error Checking
	gle	noc	z r	ent	GC	st	шt				Code	st	70
			ž	Ž			Sa	VI Name	Function Prototype	Notes	_ ც		Ē
NUMERICAL INTEGRATION	X	X		$\mid x \mid$	1			NumIntegrate_Func_Ax_Bu_K.vi		NOT USED. Should this be used or abandoned???			
	X	Χ		X				NumIntegrate_Rk4_Dbl_X_U.vi					
	X	Χ		Χ				NumIntegrate_Rk4_Dbl_X.vi					
	X	Χ		Χ				NumIntegrate_Rk4_Mat_X_U.vi					
	X	Χ		Χ				NumIntegrate_Rk4_Mat_X.vi					
	X	Χ		No				NumIntegrate_Rkdp_Func_A.vi					
	X	Χ		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					
	X	Χ		No	1			Numintegrate_Rkdp_Impl.vi					
	X	Χ		X				NumIntegrate_RKDP_Mat_X_U.vi		New replacement for RKF45			
	Χ	Χ		No	SI			NumIntegrate_Rkf45_Func_A.vi					
	Χ	Χ		No	SI			NumIntegrate_Rkf45_Func_B1.vi					
	X			No	SI			NumIntegrate_Rkf45_Func_B1B2.vi					
	X	Χ		No	SI			NumIntegrate_Rkf45_Func_B2.vi					
								NumIntegrate_RKf45_Func_Bs.vi		Removed. Replaced with newer functions.			
								NumIntegrate_RKf45_Func_Ch.vi		Removed. Replaced with newer functions.			
								NumIntegrate_RKf45_Func_Ct.vi		Removed. Replaced with newer functions.			
	X	X		No X	ı			NumIntegrate_Rkf45_Impl.vi NumIntegrate_Rkf45_Mat_X_U.vi		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			NumIntegrate_Trap_Dbl.vi					
	Χ	X	Χ	Χ	1			NumIntegrate_Trap_Mat.vi					
					<i>σ</i>								
RUNGE KUTTA TIME VARYING	X Implemented	X Documented	Not WPILIB	S Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name RungeKuttaTimeVarying_RK4_Mat_T_Y.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
NUMERICAL JACOBIAN	X X Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine		VI Name NumJacobian_U.vi NumJacobian_X.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking

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

'======= VISION

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Function Prototype Notes COMPUTER VISION UTILITIES X X CompVisionUtil_CalculateDistanceToTarget.vi CompVisionUtil_EstimateCameraToTarget.vi CompVisionUtil_EstimateFieldToCamera.vi X X X X X X X X X X X X Χ Χ CompVisionUtil_EstimateFieldToRobot.vi Χ Χ CompVisionUtil_EstimateFieldToRobot_Alt.vi

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimize	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TypeDef	Ζ	Ζ	X	Χ	N/A			ARM_FF.CTL		
	Ζ	Ζ	X	Χ	N/A			BANG_BANG.CTL		
	1		X	Χ	N/A			BICon-Matrix_FUNC_TYPE.CTL		NOT USED. Should this be deleted or abandoned???
	Ζ	Ζ	Χ	Χ	N/A			CALLBACK_FUNC_TYPE.CTL		
	Ζ	Ζ	Χ	Χ	N/A			CHASSIS_SPEEDS.CTL		
	Ζ	Ζ	X	Χ	N/A			CONTRAINED_STATE.CTL		
	Z	Ζ	X	Χ	N/A			COORDINATE_AXIS.CTL		
	Ζ	Ζ	Χ	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	X	Χ	N/A			DEBOUNCER_TYPE_ENUM.Ctl		
	Ζ	Ζ	X	Χ	N/A			DEBOUNCER.CTL		
	Ζ	Ζ	Χ	Χ	N/A			DIFF_DRIVE_ACCEL_LIMIT.CTL		
	Ζ	Ζ	Χ	Χ	N/A			DIFF_DRIVE_KINEMATICS.CTL		
	Ζ	Ζ	Χ	Χ	N/A			DIFF_DRIVE_Kitbot_WheelSize_ENUM.ctl		
	Ζ	Ζ	Χ	Χ	N/A			DiFF_DRIVE_Pose_EST.ctl		
	Ζ	Ζ	Χ	Χ	N/A			DIFF_DRIVE_ToughBoxMini_GearChoice_ENUM.ctl		
	Ζ	Ζ	Χ	Χ	N/A			DIFF_DRIVE_ToughBoxMini_MotorChoice_ENUM.ctl		
	Ζ	Ζ	Χ	Χ	N/A			DIFF_DRIVE_TRAIN_SIM_STATE_ENUM.CTL		

Z	Ζ	X	X	N/A	DIFF_DRIVE_TRAIN_SIM.ctl	
Z	Ζ	Χ	X	NA	DISPLAY_WAYPOINT.ctl	Was UTIL_WAYPOINT.VI
Z	Z	X	X	NA	DISPLAY_WEIGHTED_WAYPOINT.ctl	New V1.5. was
						UTIL_WEIGHTED_WAYPOINIT.VI
Z	Z	X	X	N/A	ELEV FF.CTL	
Z	Z	X	X	N/A	ELEVATOR SIM.CTL	
Z	Z	X	X	N/A	EXTENDED KALMAN CORRECT FUNC GROUP.CTL	
Z	_	X	X	N/A	EXTENDED KALMAN FILTER.CTL	
Z	Z	X	X	N/A	FLYWHEEL SIM.ctl	
Z	Z	X	X	N/A	FUNCTION GENERATOR.ctl	
Z	Z	X	X	N/A	FUNCTION GENERATOR MATRIX.ctl	
Z	Ζ	X	X	N/A	HOLONOMIC DRV CTRL.CTL	New 1/26/21
Z	Ζ	Χ	X	N/A	TIME INTERPOLATABLE BOOLEAN.CTL	
Z	Ζ	Χ	X	N/A	TIME INTERPOLATABLE DOUBLE.CTL	
Z	Ζ	Χ	X	N/A	TIME_INTERPOLATABLE_POSE2D.CTL	
Z	Ζ	Χ	X	N/A	TIME_INTERPOLATABLE_ROTATION2D.CTL	
Z	Ζ	Χ	X	N/A	KALMAN_FILTER_LATENCY_COMP_FUNC_GROUP.CTL	
Z	Ζ	X	X	N/A	KALMAN_FILTER_LATENCY_COMP.CTL	
Z	Ζ	X	X	N/A	KALMAN_FILTER.ctl	
Z	Ζ	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	
Z	Z	X	X	N/A	LTV_DIFF_DRIVE_CTRL.ctl	
Z	Z	X	X	N/A	LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl	
Z	Z	X	X	N/A	LTV_UNICYCLE_CONTROLLER.CTL	ODGG ETT. D
N/A	7	N/A	V	N/A	LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl	OBSOLETE – Removed
Z	Z	X	X	N/A	LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl	
Z	Z	X	X	N/A N/A	MECA_DRIVE_KINEMATICS.CTL MECA_DRIVE_ODOMETRY.CTL	
	<u>Z</u> Z	X	X	N/A	MECA_DRIVE_ODOMETRY.CTL MECA_DRIVE_POSE_EST.CTL	
Z	Z	X	X	N/A	MECA_DRIVE_FOSE_ESTICITE MECA_WHEEL_SPEEDS.CTL	
Z	Z	X	X	N/A	MEDIAN FILTER.CTL	
Z	Z	X	X	N/A	MERWE SCALED SIGMA PTS.ctl	
Z	Z	X	X	N/A	OBSERVER SNAP LIST ITEM.CTL	
Z	Z	X	X	N/A	OBSERVER SNAPSHOT.CTL	
Z	Z	X	X	N/A	PARAM STACK ITEM.CTL	
Z	Z	X	X	N/A	PARAM STACK.CTL	
Z	Z	X	X	N/A	PID ADV LIMITS.CTL	
Z	Ζ	Χ	X	N/A	PID ADV TUNING.CTL	
Z	Ζ	Χ	X	N/A	PID_CONTROLLER.CTL	
Z	Ζ	Χ	X	N/A	PID ERROR TOLERANCE.CTL	
Z	Ζ	Χ	X	N/A	PID_INPUT_LIMITS.CTL	
Z	Ζ	X	X	N/A	PID_TUNING.CTL	
Z	Ζ	Χ	X	N/A	POSE2D.CTL	
Z	Z	X	X	N/A	POSE3D.CTL	
Z	Ζ	X	X	N/A	POSEwCURVATURE.CTL	
Z	Ζ	X	X	N/A	PROFILED_PID_CONTROLLER.CTL	
Z	Z	X	X	N/A	QUATERNION.CTL	
Z	Z	X	X	N/A	RAMSETE_EXE_TUNING.CTL	
Z	Z	X	X	N/A	RAMSETE.CTL	
Z	Z	X	X	N/A	ROTATION2D.CTL	
Z	Z	X	X	N/A	ROTATION3D.CTL	
Z	Z	X	X	N/A	SIMPLE_MOTOR_FF.CTL	
Z	Z	X	X	N/A	SINGLE_JOINT_ARM_SIM.CTL	
	Z 7	X	X	N/A N/A	SLEW_RATE_LIMITER.CTL SPLINE CTRL VECTOR.CTL	
	Z 7	_	X		SPLINE_CTRL_VECTOR.CTL SPLINE.CTL	
Z	Z	X	X	N/A N/A	SWERVE DRIVE KINEMATICS.CTL	
Z	Z	X	X	N/A	SWERVE_DRIVE_KINEWATICS.CTL SWERVE DRIVE MODULE STATE.CTL	
Z	Z	X	X	N/A	SWERVE_DRIVE_MODULE_STATE.CTL SWERVE DRIVE ODOMETRY.CTL	
Z	Z	X	X	N/A	SWERVE_DRIVE_ODOMETRY.CTL SWERVE DRIVE Pose EST.CTL	
Z	Z	X	X	N/A	TIMER.CTL	
Z	Z	X	X	N/A	TRAJ CONFIG.CTL	
		_ ^ `		1 . 4// 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	

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Z	Ζ	X	Χ	N/A	TRAJ_CONSTRAINT_CENTRIPETAL_ACCEL.CTL	
Z	Ζ	X	Χ	N/A	TRAJ_CONSTRAINT_DIIF_DRIVE_KINEMATICS.CTL	
Z	Ζ	X	Χ	N/A	TRAJ_CONSTRAINT_DIIF_DRIVE_VOLTAGE.CTL	
Ζ	Ζ	X	Χ	N/A	TRAJ_CONSTRAINT_ELLIP_REGION.CTL	
1		X		N/A	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	TRAJ_CONSTRAINT_MECA_DRIVE_KINEMATICS.CTL	
Z	Ζ	X	X	N/A	TRAJ_CONSTRAINT_MINMAX.CTL	
Z	Ζ	X	Χ	N/A	TRAJ_CONSTRAINT_RECT_REGION.CTL	
Z	Ζ	X	Χ	N/A	TRAJ_CONSTRAINT_SWERVE_DRIVE_KINEMATICS.CTL	
Z	Ζ	X	Χ	N/A	TRAJ_STATE.CTL	
Z	Ζ	X	X	N/A	TRAJECTORY_SPLINE_TYPE_ENUM.CTL	
Z	Ζ	X	Χ	N/A	TRAJECTORY.CTL	
Z	Ζ	X	X	N/A	TRANSFORM2D.CTL	
Z	Ζ	X	Χ	N/A	TRANSFORM3D.CTL	
Z	Ζ	X	Χ	N/A	TRANSLATION2D.CTL	
Z	Ζ	X	Χ	N/A	TRANSLATION3D.CTL	
Z	Ζ	X	X	N/A	TRAPEZOID_PROFILE_CONSTRAINT.CTL	
Z	Ζ	X	Χ	N/A	TRAPEZOID_PROFILE_STATE.CTL	
Z	Ζ	X	Χ	N/A	TRAPEZOID_PROFILE.CTL	
Z	Ζ	X	Χ	N/A	TWIST2D.CTL	
Z	Ζ	X	Χ	N/A	TWIST3D.CTL	
Z	Z	X	Χ	N/A	UNSCENTED_KALMAN_CORRECT_FUNC_GROUP.CTL	
Z	Ζ	X	Χ	N/A	UNSCENTED_KALMAN_FILTER.ctl	
Z	Ζ	X	Χ	N/A	UNSCENTED_KALMAN_NEW_FUNC_GROUP.CTL	
Z	Ζ	X	Χ	N/A	UTIL_PATHFINDER_CONFIG.CTL	
N/A		N/A		N/A	WAYPOINTS.CTL	Delete – obsolete
Z	Ζ	Χ	Χ	NA	WEIGHTED_WAYPOINT.CTL	New V1.5
N/A		N/A		N/A	X_Y_HEADINGS.CTL	Delete – obsolete
Z	Ζ	X	Χ	N/A	X_Y_PAIR.CTL	

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