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 1038 1009 323 985 593 51 VI Total (X) 930 CTL Total (Z) 108
> VI Shell Total (/) 4 CTRL Shell Total (\)

Doc completed Pct 97.21% Optimization Pct 57.13%

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

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

> Function Prototype VI Name Notes ANALOG DELAY X X X AnalogDelay.vi Similar to interpolated tree map. ğ

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimize	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
FUNCTION GENERATOR	X	Χ		Χ	I			FunctionGenerator_Add_Value.vi		Similar to interpolated tree map			
	X	Χ		Χ	1			FunctionGenerator_Add_XY.vi		Similar to interpolated tree map			
	X	X		Χ	1			FunctionGenerator_Calculate.vi		Similar to interpolated tree map			
	X	Χ		Χ	SI			FunctionGenerator_Clear.vi					
	X	X	Χ	Χ	1			FunctionGenerator_Execute.vi		Similar to interpolated tree map			
	X	X		X	SI			FunctionGenerator New.vi		Similar to interpolated tree map			

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
FUNCTION GENERATOR MATRIX $X$	X	X	X	1			FunctionGeneratoMatrixr_Add.vi		Similar to interpolated tree map			
X	Χ	X	X	1			FunctionGenerator_Calculate.vi		Similar to interpolated tree map			
X	Χ	X	Χ	SI			FunctionGenerator_New.vi		Similar to interpolated tree map			

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FRC LabVIEW Trajectory Library – VI Implementatio								
Revision 2.X 5/2/2022 – added implicit model follower and tir	ne interpolatable ro	utines. peziu	Ę					
	Implemented Documented Not WPILIB	u Item cution Opti Routine	e Progra			Review	rogram	Checking
	Implement Document Not WPILI	st ec	ldmin			ape i	Test P	Ţ.
			δ VI Name	Function Prototype	Notes	ც	- Je	Errol
LINEAR FILTE	R X X X X X X X X X X X X X X X X X X X	X I X SI	LinearFilter_BackwardFiniteDifference.vi LinearFilter_Calculate.vi					
	X X X	X X	LinearFilter_Calculate.vi					
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	XI	X LinearFilter_Execute.vi		Labview style helper			
	XX	No I	LinearFilter_Factorial.vi		AN INTERNAL ROUTINE			
	X X	1	LinearFilter_FiniteDifference.vi					
	X   X   X   X   X   X   X   X   X   X	X X X X	LinearFilter_HighPass.vi LinearFilter_HighPassBW1.vi					
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	XX	LinearFilter_HighPassBW2.vi					
	X X X	XX	LinearFilter_LowPassBW1.vi					
	X X X		LinearFilter_LowPassBW2.vi					
	X X X X	XX	LinearFilter_MovingAverage.vi					
	X X X X	X I X SI	LinearFilter_New.vi LinearFilter Reset.vi					
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	X SI	LinearFilter ResetToValue.vi					
	XX	XX	LinearFilter_SinglePoleIIR.vi					
	X X X	XX	LinearFilter_TimeConst.vi					
MEDIAN FILTE	X Implemente X Documente Not WPILIB	X Menu Item X Execution Op Test Routine	ณ์ อ อ อ อ อ o VI Name MedianFilter_Calculate.vi	Function Prototype	Notes	Code Rev	Test Progr	Error Checking
	X X X		X MedianFilter_Execute.vi		Labview style helper			
	X X X X	X SI	MedianFilter_New.vi  MedianFilter_Reset.vi					
	X   X   X   X   X   X   X   X   X   X	X SI	MedianFilter ResetToValue.vi					
	mplemented Documented Not WPILIB	Menu Item Execution Optimized Test Routine	ample Program			ode Review	est Program	ror Checking
0			δ VI Name	Function Prototype	Notes	ŏ		Ψ
SLEW RATE FILTE	R X X X X X	X I X SI	SlewRateLimiter_Calculate.vi SlewRateLimiter Close.vi					
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		X SlewRateLimiter Execute.vi		Labview style helper			
		X SI	SlewRateLimiter_GetRate.vi		, ,			
	XX	XI	SlewRateLimiter_New.vi					
	XX	X I	SlewRateLimiter_NewInitialZero.vi			'		
	XX	X I	SlewRateLimiter_Reset.vi					
	XX	X SI	SlewRateLimiter_SetRate.vi					
	Implemented Documented Not WPILIB	Menu Item Execution Optimizec Test Routine	Sample Program	Function Prototype	Notes	2ode Review	Test Program	Frror Checking
TIME	$\mathbb{R} X X X$		Timer Close.vi	i unction Frototype	releases semaphore	$\overline{}$	7	
111112	XX	X	X Timer_Get.vi		, siegeod domaphoro			
	X X X		Timer_GetAndReset.vi					

X X X X X X X X X X X X X X X X X X X		X .	X X X X X		X	Timer_GetInternal.vi Timer_HasPeriodPassed.vi Timer_HasPeriodPassedOnce.vi Timer New.vi		Internal (private) only			
X		X .	X X X		X	Timer_HasPeriodPassedOnce.vi					
X X X X X X X X X X X X X X X X X X X	( ) ( )	X /	X X		Χ				+		
X X X X X X X X X X X	( )	X /	X								
X X X X X X	( )	X 1	Vo			Timer Reset.vi					
X X	(		VO		^	Timer ResetInternal		Internal (private) only			
X X	(		X			Timer Start.vi		internal (private) only			
X	, ,	-   -	X			Timer_Stop.vi			-		
		v 1	Vo		^	Timer StopInternal.vi		Internal (private) only			
	\	\   1	VO			Timer_Stopinternal.vi		internal (private) only			
X X X X X X X X X X X		X / / / / / / / / / / / / / / / / / / /	X Wenu Item X X	I I SI I	lest Koutine Sample Program	VI Name  TimeInterpBoolean_AddSample.vi TimeInterpBoolean_CleanUp.vi TimeInterpBoolean_Clear.vi TimeInterpBoolean_GetSample.vi TimeInterpBoolean_New.vi	Function Prototype	Notes Update to use create matrix Update to use create matrix	Code Review	Test Program	Error Checking
$\frac{\hat{x}}{X}$		· ·	$\frac{1}{X}$	s <i>i</i>							
X X X X X X X X X X X X		X / / / / / / / / / / / / / / / / / / /	X Wenu Item X X		Sample Program	VI Name TimeInterpDouble_AddSample.vi TimeInterpDouble_CleanUp.vi TimeInterpDouble_Clear.vi TimeInterpDouble_GetSample.vi	Function Prototype	Notes Update to use create matrix Update to use create matrix	Code Review	Test Program	Error Checking
X X		Υ .	X S	SI		TimeInterpDouble New.vi					
XX	( )	Υ .	X S	SI		TimeInterpDouble_SetMaxTime.vi					
X X X X X X X X X X X X X X X X X X X			X Wenu Item X X X X X X X X X X X X X X X X X X X	I Execution	st Koutil male Pr	VI Name  TimeInterpPose2d_AddSample.vi TimeInterpPose2d_CleanUp.vi TimeInterpPose2d_Clear.vi TimeInterpPose2d_GetSample.vi TimeInterpPose2d_New.vi TimeInterpPose2d_SetMaxTime.vi	Function Prototype	Notes Update to use create matrix Update to use create matrix	Code Review	Test Program	Error Checking
X	( )	X X	ok X Menu Item	I   Execution	l est Koutine Sample Program	VI Name TimeInterpRotation2d_AddSample.vi TimeInterpRotation2d_CleanUp.vi TimeInterpRotation2d_Clear.vi TimeInterpRotation2d_GetSample.vi	Function Prototype	Notes Update to use create matrix Update to use create matrix	Code Review	Test Program	Error Checking
	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X         X	X         X		X         X	X	X	V	X X X X X X X X X X X X X X X X X X X	X

Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines.

X
X
X
X
SI

X X X X

No

No

XX

XX

TimeInterpRotation2d SetMaxTime.vi

Debouncer\_Execute.vi

Debouncer\_HasElapsed.vi

Debouncer Reset.vi

X   X   X	XX	<i>( X</i>	Test Routine	VI Name  DigSeqLogic_Delay.vi  DigSeqLogic_On_Delay.vi  DigSeqLogic_Off_Delay.vi  DigSeqLogic_Off_Delay.vi  DigSeqLogic_One_Shot.vi  DigSeqLogic_SR_Flip_Flop.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
DEBOUNCER X		vvr it.	Test Routine	VI Name  Debouncer_New.vi  Debouncer_Calculate.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking

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

> VI Name Function Prototype Notes ARM FF X X ArmFF Calculate.vi ArmFF\_CalculateVelocityOnly.vi XX X ArmFF\_Execute.vi LabVIEW style single call Χ ArmFF\_ExecuteVelocityOnly.vi LabVIEW style single call X X Χ ArmFF\_MaxAchieveAccel.vi XX Χ ArmFF\_MaxAchieveVelocity.vi XX Χ ArmFF\_MinAchieveAccel.vi ArmFF\_MinAchieveVelocity.vi XX Χ XX Χ ArmFF\_New\_ZeroGravity.vi ArmFF New.vi XX Χ

Menu Item VI Name Function Prototype Notes BANG BANG X X Χ SI BangBang\_AtSetpoint.vi BangBang\_Calculate\_PV.vi
BangBang\_Calculate\_SP\_PV.vi X X X X X SI X SI X X X X SI X X X X SI BangBang\_Execute.vi BangBang GetAll.vi XX

				ines.							
	Χ	Χ		Χ	SI		BangBang_GetError.vi				
	Χ	Χ		Χ	SI		BangBang_New.vi				
	X	X		X	SI		BangBang_SetSetpoint.vi				
	Χ	Χ		Χ	SI		BangBang_SetTolerance.vi				
ONTROLLER UTIL	X Implemented	X Documented	Not WPILIB	X Menu Item	Secution Optimized	Test Routine	VI Name    ControllerUtil_GetModulusError.vi	Notes This was short lived in WPILIB, but still useful here.	Code Review	Test Program	:
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	ଞ୍ଚିତ୍ର ବର୍ଷ ଆଧିକ VI Name Function Prototype	Notes	Code Review	Test Program	
ELEV FF	Χ	X		X			ElevFF_Calculate.vi				
	Χ	Χ		Χ			ElevFF_CalculateVelocityOnly.vi				
			X				ElevFF_Execute.vi	LabVIEW style single call			
	V		Χ				ElevFF_ExecuteVelocityOnly.vi	LabVIEW style single call			
	X	X		X			ElevFF_MaxAchieveAccel.vi ElevFF MaxAchieveVelocity.vi				
	X	X		X			ElevFF_MinAchieveAccel.vi				
	X	$\hat{x}$		$\hat{x}$			ElevFF MinAchieveAccei.vi				
	X	X		X			ElevFF New ZeroAccel.vi				
	X	X		X			ElevFF_New.vi				
	nted	pə.			ž.		ua u			~	
HOL_DRV_CTRL	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X X X	Χ	IS IS Execution Optimized	Test Routine	VI Name  Function Prototype  HolDrvCtrl_AdvCalculate_Trajectory.vi  HolDrvCtrl_AdvCalculate.vi  HolDrvCtrl_AtReference.vi  HolDrvCtrl_Calculate_Trajectory.vi  HolDrvCtrl_Calculate.vi  HolDrvCtrl_Execute_Trajectory.vi  HolDrvCtrl_Execute_Trajectory.vi  HolDrvCtrl_Execute.vi  HolDrvCtrl_PackExecuteSP.vi  HolDrvCtrl_PackPiD.vi  HolDrvCtrl_PackProfPlD.vi  HolDrvCtrl_SetEnabled.vi  HolDrvCtrl_SetEnabled.vi  HolDrvCtrl_SetTolerance.vi	Notes  Added 1/24/2022  Added 1/24/2022  Added 1/26/21  Added 1/26/21  Added 1/26/21  Added 1/26/21  Added 1/24/2022  Future  Added 1/26/21  Added 1/24/2022  Added 1/24/2022  Added 1/24/2022  Added 1/26/21  Added 1/26/21  Added 1/26/21	Code Review	Test Program	

e interpolata	ble rou	tines.				
XX	X	Χ		X PIDController_AdvExecute.vi	Labview style helper. Advanced PID	
XX		Χ	SI	PIDController AtSetpoint.vi		
XX		Х		PIDController Calculate PV.vi		
XX		Х		PIDController_Calculate_SP_PV.vi		
XX		Х	SI	PIDController DisableContinousInput.vi		
XX		X	SI	PIDController EnableContinousInput.vi		
XX	X	Х		X PIDController Execute.vi	Labview style helper	
				PIDController GetContinuousError.vi	OBSOLETÉ – Removed	
XX		Χ	SI	PIDController GetPeriod.vi		
XX		Χ	SI	PIDController GetPID.vi		
XX		Х	SI	PIDController GetPositionError.vi		
XX		X	SI	PIDController_GetSetpoint.vi		
XX		Х	SI	PIDController GetVelocityError.vi		
XX		Х	SI	PIDController_IsContinuousInputEnabled.vi		
XX		X	1	PIDController New.vi		
XX		X	1	PIDController NewPeriod.vi		
XX	X	X	SI	PIDController Pack AdvLimits.vi		
XX	X	X	SI	PIDController_Pack_AdvTuning.vi		
XX		Х	SI	PIDController Pack ErrorTolerance.vi		
XX	X	Х	SI	PIDController Pack InputLimits.vi		
XX	X	Х	SI	PIDController Pack Tuning.vi		
XX		Х	SI	PIDController Reset.vi		
XX		Х	SI	PIDController SetD.vi		
XX	X	Х	SI	PIDController SetDerivativeFilter.vi	Advanced PID	
XX	X	No		PIDController SetFeedForward OBSOLETE DELETE.vi	Advanced PID, Obsolete –	
					DELETE	
XX	X	No		PIDController_SetFFGain_OBSOLETE_DELETE.vi	Advanced PID, Obsolete – DELETE	
XX		Χ	SI	PIDController Setl.vi		
				PIDController SetInputRange.vi	OBSOLETE – Removed	
XX		Χ	SI	PIDController_SetIntegratorRange.vi	333333	
XX	X	X	SI	PIDController SetOutputLimits.vi	Advanced PID	
XX		Χ	SI	PIDController SetP.vi		
X X	X	X	SI	PIDController SetPeriod.vi		
X X		X	SI	PIDController SetPID.vi		
XX	X	X	SI	PIDController_SetPIDF.vi	Advanced PID	
XX		X	SI	PIDController_SetSetpoint.vi		
XX		X	SI	PIDController SetTolerance.vi		
XX		Χ	SI	PIDController SetTolerancePandV.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	 /I Name Function Prototype Notes	Code Review	Test Program	Error Checking
PROFILED PID CONTROLLER	Χ	Χ		Χ	SI		ProfiledPIDController_AtGoal.vi			
	Χ	Χ		Χ	SI		ProfiledPIDController_AtSetpoint.vi			
	Χ	Χ		Χ			ProfiledPIDController_Calculate_Meas_Goal.vi			
	Χ	Χ		Χ			ProfiledPIDController_Calculate_Meas_StateGoal_TrapCnsrt.vi			
	Χ	Χ		Χ			ProfiledPIDController_Calculate_Meas_StateGoal.vi			
	Χ	Χ		Χ			ProfiledPIDController_Calculate_Meas.vi			
	Χ	Χ		Χ	SI		ProfiledPIDController_DisableContInput.vi			
	Χ	Χ		Χ	SI		ProfiledPIDController_EnableContInput.vi			
	Χ	X	Χ	X	1		ProfiledPIDController_Execute.vi Single call LabVIEW style function	n.		
	Χ	Χ		Χ	SI		ProfiledPIDController_GetGoal.vi			
	Χ	Χ		Χ	SI		ProfiledPIDController_GetPeriod.vi			
	Χ	Χ	Χ	Χ	SI		ProfiledPIDController_GetPID.vi WPILIB has separate getters.			
	Χ	Χ		Χ	SI		ProfiledPIDController_GetPositionError.vi			
	Χ	Χ		Χ	SI		ProfiledPIDController_GetSetpoint.vi			
	Χ	Χ		Χ	SI		ProfiledPIDController_GetVelocityError.vi			
	X	X		X	1		ProfiledPIDController New.vi			

FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time interpretations of the interpretation of the control of the control

ime i	nterpo	olatab	le routines.		
	X	Χ	X	1	ProfiledPIDController_NewPeriod.vi
	X	Χ	X	SI	ProfiledPIDController_Reset_PosOnly.vi
	X	Χ	X	SI	ProfiledPIDController_Reset_PosVel.vi
	X	Χ	X	SI	ProfiledPIDController_Reset.vi
	X	Χ	X	SI	ProfiledPIDController_SetConstraints.vi
	X	Χ	X	SI	ProfiledPIDController_SetGoal_PosOnly.vi
	X	Χ	X	SI	ProfiledPIDController_SetGoal.vi
	X	Χ	X	SI	ProfiledPIDController_SetIntegratorRange.vi
	X	Χ	X	SI	ProfiledPIDController_SetPID.vi
	X	Χ	X	SI	ProfiledPIDController_SetTolerance_PosOnly.vi
	X	Χ	X	SI	ProfiledPIDController_SetTolerance_PosVel.vi

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Ample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
RAMSETE	Χ	X		X	SI		Ramsete_AtReference.vi	AtReference				
	Χ	X		Χ	Χ		Ramsete_Calculate_Trajectory.vi	calculate_trajectory				
	Χ	X		Χ	X		Ramsete_Calculate.vi	calculate				
	Χ	X	Χ	Χ	Χ		Ramsete_Diff_DO_Eng.vi					
	Χ	X	X	Χ	X		Ramsete_Diff_DO_SI.vi					
	Χ	X	X	Χ	1		Ramsete_Execute_ENG.vi	Use this one!!				
	Χ	X	X	Χ	SI		Ramsete_Execute_PackTuning_ENG.vi					
	Χ	X	X	Χ	SI		Ramsete_Execute_PackTuning.vi					
	Χ	X	X	Χ	1		Ramsete_Execute.vi					
	Χ	X		Χ	SI		Ramsete_New_B_Z.vi	new(b, zeta)				
	Χ	X		Χ	SI		Ramsete_New.vi	new				
	Χ	X		Χ	SI		Ramsete_SetEnabled.vi	SetEnabled				
	Χ	X		Χ	SI		Ramsete_SetTolerance.vi	SetTolerance				
	X	X		X	X		Ramsete SINC.vi	sinc	internal			

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimiz	Test Routine Sample Program awa IA	Function Prototype Notes	Code Review	Test Program	Error Checking
SIMPLE MOTOR FEEDFORWARD	X	X	X	Χ	SI	SimpleMotorFF Calculate CalcAccel.vi				
	X	X		Χ		SimpleMotorFF_Calculate_NextV_Dt.vi				
	X	Χ		Χ	SI	SimpleMotorFF_Calculate.vi	public double calculate(double velocity, double acceleration)			
	Χ	X		Χ	SI	SimpleMotorFF_CalculateVelocityOnly.vi	public double calculate(double velocity)			
	X	X		X	X	SimpleMotorFF_MaxAchieveAccel.vi	public double maxAchievableAcceleration(double maxVoltage, double velocity)			
	X	X		X	X	SimpleMotorFF_MaxAchieveVel.vi	public double maxAchievableVelocity(double maxVoltage, double acceleration)			
	X	X		X	X	SimpleMotorFF_MinAchieveAccel.vi	public double minAchievableAcceleration(double maxVoltage, double velocity)			
	X	X		X	X	SimpleMotorFF_MinAchieveVel.vi	public double minAchievableVelocity(double maxVoltage, double acceleration)			
	X	X		X	SI	SimpleMotorFF_New.vi	public SimpleMotorFeedforward(double ks, double kv, double ka)			
							public SimpleMotorFeedforward(double ks, double kv)			

'=======

GEOMETRY '========

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	ry Library – VI Implementation dded implicit model follower and time		atable ro	outines								
VISIOII 2.X 3/2/2022 — at	uded implicit model follower and time	ted .	Documented graphs of the Not WPILIB		Execution Optimized	Test Routine Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	zero v Obocina
	COORDINATE AXIS	X X X X X 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		CoordAxis_ D.vi CoordAxis_ E.vi CoordAxis_ N.vi CoordAxis_ New.vi CoordAxis_ S.vi CoordAxis_ U.vi CoordAxis_ W.vi					
		nplemented	Documented Not WPILIB	Menu Item	xecution Optimized	Test Routine Sample Program				Code Review	Test Program	
	COORDINATE SYSTEM	X X		X	SI	X X	VI Name CoordSystem_Convert_Pose3d.vi	Function Prototype	Notes	<u>0</u>	<u> </u>	$\top$
		X	X	X	SI		CoordSystem_Convert_Rotation3d.vi					
		XXX	X X	X	SI SI	X	CoordSystem_Convert_Translation3d.vi CoordSystem_EDN.vi					_
		X	X	X	SI	Χ	CoordSystem_NED.vi					
		XXX	X X	X	SI SI	X	CoordSystem New.vi CoordSystem NWU.vi					
			Documented   Not WPILIB	Me		Test Routine Sample Prog	VI Name	Function Prototype	Notes	Code Review	Test Progran	
	POSE2D		X X	X	SI X		Pose2d_Equals.VI Pose2d_Exp.vi	boolean equals( other obj ) pose2d exp( twist2d twist )				
			X	X	SI		Pose2d_exp.vi Pose2d_getRotation.vi	rotation2d getRotation()	can also use cluster unpack			+
		X	X	Χ	SI		Pose2d_getTranslation.vi	translation2d getTranslation()	can also use cluster unpack			
		XXX	X X X X	X	SI SI		Pose2d_getXY.vi Pose2d_getXYAngle.vi					+
		X	X	X	1		Pose2d_Interpolate.vi					+
		X	X	X	X		Pose2d_Log.vi	twist2d log( pose2d end )				
		XXX	X Y	X	SI							+
		X	X	X	SI		Pose2d_New.vi	pose2d new( double x, double y, rotation2d )				
		X	X	X	SI							
		$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	X	X	SI							-
		7.			G.			pose2d new()	can use cluster constant			
		X	WPILIB	X X X X X X X	X SI	Test Routine Sample Program	Pose2d_Log.vi Pose2d_Minus.vi Pose2d_New_TRRO.vi	pose2d plus( transform2d other ) pose2d relativeto( pose2d other ) pose2d transformby( transform2d other )		can use cluster constant	Review	Review
		ıajdu	Docun Not W	Menu	хесп	est F amp	VI Nama	Function Protetring	Notes		Code	Code . Test F
	POSE3D	Ξ .		X		Sa Te	VI Name Pose3d_Equals.VI	Function Prototype	Notes	ŏ	<u>\</u>	-
		/	-	- ' '	٠,							+
		X	X	X	X		Pose3d_Exp.vi					$\perp$
		$X \setminus X$	X X X	X	SI SI		Pose3d_Exp.vi Pose3d_getRotation.vi Pose3d_getTranslation.vi					$\pm$

FRC LabVIEW Trajectory Library – VI Implementation List
Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines.

| X | X | X | X | SI | X | X | X | I |

Pose3d\_getXYZ.vi

	X	X	X	1			Pose3d_Interpolate.vi					
	X	X	X	X			Pose3d_Log.vi					
		X	X				Pose3d Minus.vi					
		X	X				Pose3d New.vi					
	X	X	X				Pose3d New Default.vi					
	X	X	X				Pose3d New Trans3dRot3d.vi					
		X	X				Pose3d Plus.vi					
		X	X	SI			Pose3d RelativeTo.vi					
	X	X	No	SI			Pose3d_RotationVectorToMatrix.vi					
	X	X	X				Pose3d ToPose2d.vi					
		X	X				Pose3d_TransformBy.vi					
				-								
QUATERNION	X X Implemented	X X Documented	Not WPILIB X   X   Menu Item		Test Routine		VI Name <i>Quaternion_Equals.vi</i> Quaternion_Get_All.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
			X	SI								
		X X	X				Quaternion_Get_LVQuat.vi Quaternion_Get_Vect.vi					
		X	X	SI			Quaternion Get W.vi					
	X	$\hat{X}$	X	SI			Quaternion_Get_w.vi Quaternion_Inverse.vi					
		X	X	SI			Quaternion New.vi					
		X	X	SI			Quaternion New Default.vi					
	X	$\stackrel{\wedge}{X}$	X	SI			Quaternion_New_Default.vi					
	X	$\hat{X}$	X				Quaternion_Normalize.vi					
	X	$\stackrel{\wedge}{X}$	X				Quaternion_Normalize.vi Quaternion_Plus.vi					
		$\hat{x}$	X				Quaternion_Fids.vi					
	X	$\hat{x}$	X				Quaternion_Times.vi Quaternion ToRotationVector.vi					
ROTATION2D	mplemented	Documented	Not WPILIB  X Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
ROTATION2D	$\overline{X}$	$\overline{\chi}$	X	SI	Ι		Rotation2d_CreateAngle.vi	rotation2d new( double value )				7
	X	X	X	SI			Rotation2d_CreateAngleDegrees.vi	rotation2d fromDegrees( double degrees )	convert to radians then create			
	X	X	X	SI			Rotation2d_CreateAngleRotations.vi					
	X	X	X	SI			Rotation2d_CreateXY.vi	rotation2d new( double x, double y )				
	X	X	X	SI			Rotation2d_Equals.vi	boolean equals( rotation2d other )				
	X		X X	SI			Rotation2d_GetAngleCosSin.vi		New 1/26/21			
	X	Χ	X				Rotation2d_GetCos.VI	double getCos()	use cluster unpack			
	X	X	X	SI			Rotation2d_GetDegrees.VI	double getDegrees()	use cluster unpack, then convert to			
			1	1	1				degree			
	1	V					D-4-4:0-1 O-4D4: \ \( \) \( \)	devide wat Dedicary				
	X	X	X	SI			Rotation2d_GetRadians.VI	double getRadians()	use cluster unpack			
	X	X	X	SI			Rotation2d_GetRotations.vi	-	use cluster unpack			
	X	X X	X	SI SI			Rotation2d_GetRotations.vi Rotation2d_GetSin.VI	double getSin()	use cluster unpack use cluster unpack			
	X X X	X X X	X X X	SI SI			Rotation2d_GetRotations.vi Rotation2d_GetSin.VI Rotation2d_GetTan.VI	-	use cluster unpack			
	X X X X	X X X X	X X X X	SI SI SI			Rotation2d_GetRotations.vi Rotation2d_GetSin.VI Rotation2d_GetTan.VI Rotation2d_Interpolate.vi	double getSin() double getTan()	use cluster unpack use cluster unpack			
	X X X X	X X X X	X X X X	SI SI SI SI			Rotation2d GetRotations.vi Rotation2d GetSin.VI Rotation2d GetTan.VI Rotation2d Interpolate.vi Rotation2d Minus.vi	double getSin() double getTan() rotation2d minus( rotation2d other )	use cluster unpack use cluster unpack			
	X X X X X	X X X X X X X X	X X X X X	SI SI SI SI SI			Rotation2d GetRotations.vi Rotation2d GetSin.VI Rotation2d GetTan.VI Rotation2d Interpolate.vi Rotation2d Minus.vi Rotation2d Plus.vi	double getSin() double getTan()  rotation2d minus( rotation2d other ) rotation2d plus( rotation2d other )	use cluster unpack use cluster unpack			
	X X X X X X	X	X X X X X X	SI SI SI SI SI SI			Rotation2d_GetRotations.vi Rotation2d_GetSin.VI Rotation2d_GetTan.VI Rotation2d_Interpolate.vi Rotation2d_Minus.vi Rotation2d_Plus.vi Rotation2d_RotateBy.vi	double getSin() double getTan()  rotation2d minus( rotation2d other ) rotation2d plus( rotation2d other ) rotation2d rotateby( rotation2d other )	use cluster unpack use cluster unpack			
	X X X X X X X	X X X X X X X	X	SI   SI   SI   SI   SI   SI			Rotation2d GetRotations.vi Rotation2d GetSin.VI Rotation2d GetTan.VI Rotation2d Interpolate.vi Rotation2d Minus.vi Rotation2d Plus.vi Rotation2d RotateBy.vi Rotation2d_Times.vi	double getSin() double getTan()  rotation2d minus( rotation2d other ) rotation2d plus( rotation2d other ) rotation2d rotateby( rotation2d other ) rotation2d times( double scalar )	use cluster unpack use cluster unpack			
	X X X X X X X	X	X X X X X X	SI   SI   SI   SI   SI   SI			Rotation2d_GetRotations.vi Rotation2d_GetSin.VI Rotation2d_GetTan.VI Rotation2d_Interpolate.vi Rotation2d_Minus.vi Rotation2d_Plus.vi Rotation2d_RotateBy.vi	double getSin() double getTan()  rotation2d minus( rotation2d other ) rotation2d plus( rotation2d other ) rotation2d rotateby( rotation2d other )	use cluster unpack use cluster unpack			

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RC LabVIEW Trajectory Library – VI Implementation		la mandina a							
evision 2.X 5/2/2022 – added implicit model follower and tim	• interpolatab	bie routines.	pə						
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	ent ent	PILI	Routine				Revi	Progra	hec
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	рос Оос	Not W Menu	Exec Test	VI Name	Function Prototype	Notes	Ö	Test	Errc
ROTATION3D		X	SI	Rotation3d_Create_AxisAngle.vi	71				
	XX	X	SI	Rotation3d_Create_Default.vi					
	XX		SI	Rotation3d_Create_Quaternion.vi					
	XX	X	SI	Rotation3d_Create_RollPitchYaw.vi					
	X X X X		SI SI	Rotation3d_Equals.vi Rotation3d_GetAxisAngle.vi					
	$\begin{array}{c c} X & X \\ \hline X & X \\ \end{array}$		SI	Rotation3d_GetQuaternion.vi					
	XX	X	SI	Rotation3d GetXYZ.vi					
	XX	X	SI	Rotation3d_Interpolate.vi					
	XX		SI	Rotation3d_Minus.vi					
	XX	X	SI	Rotation3d_Plus.vi					
	X X X X	X	SI SI	Rotation3d_RotateBy.vi Rotation3d_Times.vi					
	XXX	X	31	Rotation3d_Times.vi Rotation3d_ToRotation2d.vi					
	X X		SI	Rotation3d UnaryMinus.vi					
TRANSFORM2D		X   X   X   X   X   X   X   X   X   X	S	VI Name Transform2d_Create_PosePose.vi Transform2d_Create_TransRot.vi Transform2d_Equals.VI Transform2d_GetRotation.VI Transform2d_GetTranslation.VI Transform2d_GetXY.vi Transform2d_GetXY.vi Transform2d_GetXYAngle.vi Transform2d_Inverse.vi Transform2d_Plus.vi Transform2d_Times.vi	Function Prototype transform2d new( pose2d, pose2d ) transform2d new( translation2d, rotation2d ) boolean equals( other transform2d ) rotation2d getRotation() translation2d getTranslation() transform inverse()  transform2d times( double scalar )	use cluster unpack use cluster unpack use cluster unpack	Code Review	Test Program	Error Checkin
					transform2d new( )	can use cluster constant			
	nplemented ocumented	ot WPILIB denu Item	Execution Optimized Test Routine	VI Name	Function Prototype	Notes	ode Review	Test Program	Error Checking
TRANSFORM3D	$X \mid X$		SI C	Transform3d Create Default.vi	i undion Fiolotype	INULES	<u> </u>		Ш
			31	Transform3d_Create_Delaut.vi Transform3d_Create_Pose3dPose.3dvi					
TIGHTO OKINDE	XX	X	SI	Hansioniou Create rosesorose sovi					
TARIO OTHIOD	X X X X	X	SI SI	Transform3d_Create_Fose3dFot3d.vi					
TARGE ORIGINAL	X X X X	X	SI SI	Transform3d_Create_Trans3dRot3d.vi Transform3d_Equals.VI					
TARGE ON WISE	X   X   X   X   X   X   X   X   X   X	X X X	SI SI	Transform3d_Create_Trans3dRot3d.vi Transform3d_Equals.VI Transform3d_GetRotation3d.VI					
TARGI ONIISD	X   X   X   X   X   X   X   X   X   X	X X X	SI SI SI	Transform3d_Create_Trans3dRot3d.vi Transform3d_Equals.VI Transform3d_GetRotation3d.VI Transform3d_GetTranslation3d.VI					
TARGI ONING	X X X X X X X X	X X X X X	SI SI SI SI	Transform3d_Create_Trans3dRot3d.vi Transform3d_Equals.VI Transform3d_GetRotation3d.VI Transform3d_GetTranslation3d.VI Transform3d_GetXYZ.vi					
TARGI ONING	X X X X X X X X X X	X   X   X   X   X   X   X   X   X   X	SI	Transform3d_Create_Trans3dRot3d.vi Transform3d_Equals.VI Transform3d_GetRotation3d.VI Transform3d_GetTranslation3d.VI Transform3d_GetXYZ.vi Transform3d_Inverse.vi					
TARGI ONING	X X X X X X X X X X X X X X X X X X X	X	SI	Transform3d_Create_Trans3dRot3d.vi Transform3d_Equals.VI Transform3d_GetRotation3d.VI Transform3d_GetTranslation3d.VI Transform3d_GetXYZ.vi Transform3d_Inverse.vi Transform3d_Plus.vi					
TARGI ONING	X X X X X X X X X X	X	SI	Transform3d_Create_Trans3dRot3d.vi Transform3d_Equals.VI Transform3d_GetRotation3d.VI Transform3d_GetTranslation3d.VI Transform3d_GetXYZ.vi Transform3d_Inverse.vi					

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FRC LabVIEW Trajectory Library – V													
Revision 2.X 5/2/2022 – added implicit mo	odel follower and time	interpol	atable	routin	es.								
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		nplement	ımer	WPILIB	u Ite utio	Rou	ple F				Re	Progr	$\varsigma$
		,mple	Documen	Not 1	Menu Iten Execution	Test Routine	Sample	VI Name	Function Prototype	Notes	Code	Test	Error
	TRANSLATION2D	X .	X		X S	1		Translation2d_Create_DistAng.vi					7
			X		X S	<u>'</u>		Translation2d_Create.vi	translation2d new( double x, double y )				
	-		X X		X S	,		Translation2d_Equals.vi Translation2d_GetAngle.vi	boolean equals( translation other )				
			$\frac{x}{x}$		X S			Translation2d_GetDistance.vi	double getDistance( translation2d other )				
		Χ .	X	7	X S	'		Translation2d_GetNorm.VI	double getNorm()	can use cluster unpack			
			Χ		X S			Translation2d_GetX.VI	double getX()	can use cluster unpack			
	-			X	X S			Translation2d_GetXY.VI	devide met//)	an usa shistan uma sik			
	-		X X		X S	,		Translation2d_GetY.VI Translation2d Interpolate.vi	double getY()	can use cluster unpack			
			$\hat{X}$	+	X S			Translation2d Minus.vi	translation2d minus( translation2d other )				
			X		X S			Translation2d_Plus.vi	translation2d plus( translation2d other )				
			Χ		X S	1		Translation2d_RotateBy.vi	translation2d rotateBy( rotation2d other )				
	_		X		X S	!		Translation2d_Times.vi	translation2d times( double scalar )				
		Χ .	Χ		X S			Translation2d_UnaryMinus.vi	translation2d unaryminus()	use alluster constant			
									translation2d new() translation2d div( double scalar )	can use cluster constant can multiply by 1/scalar			
		nted	nted	riB	m n Ontimi	itine	Program				view	gram	ecking
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	TRANSLATION3D		<b>-</b>		<u> </u>			Translation3d Create.vi	r unction Prototype	Notes			
		X .	X	,	X S	'		Translation3d_Create_Default.vi					
			Χ		X S			Translation3d_Create_DistAng.vi					
	-		X		X S			Translation3d_Div.vi					
	-		X X		X S			Translation3d_Equals.vi Translation3d GetDistance.vi					
	-		$\frac{\lambda}{X}$		X S			Translation3d GetNorm.VI					
	-	X	X	X	x s			Translation3d_GetXYZ.vi					
		X .	X		X S	'		Translation3d_Interpolate.vi					
		Χ .	X	<u>_</u> -	X S	'		Translation3d_Minus.vi					
	-	X .	X X		X S	,		Translation3d_Plus.vi Translation3d_RotateBy.vi					
			$\hat{X}$	+	X S	,		Translation3d Times.vi					
	-	X		+	X S	,		Translation3d ToTranslation2d.vi					
	-	X .	$\overline{X}$		X S	'		Translation3d_UnaryMinus.vi					
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		olemented	cumented	t WPILIB		st Routine	mple Prog				de Review	st Program	or Checking
				Not W	Menu Execu	Test	Sample Prog	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
	TWIST2D[		$\overline{X}$			Test	Sample Prog	VI Name Twist2d_Create.vi Twist2d_Equals.VI	Function Prototype twist new( x, y, theta ) boolean equals( obj other )	Notes	Code Review	Test Program	

		Ğ	×	Ž	щ	7e	SS	VI Name	Function Prototype	Notes		7e	ш
DIFFERENTIAL DRIVE ODOMETRY			X					DiffOdometry_Execute.vi		DONT NEED			
	X	X		X	X			DiffOdometry_Update.vi	pose2d update( rotation2d gyro, double leftdist, double right dist )	Incorporates enhanced reset			
									diffDrOdom new( rotation gyro, pose initial )				
									diffDrOdom new( rotation gyro )				
									void resetPosition( pose2d, rotation2d )	incorporated into "update"			
									pose2d getPoseMeters()				
DIFFERENTIAL DRIVE WHEEL SPEEDS	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE WHEEL SPEEDS									diffDrWheelSpeeds new()				
		~						D'MAIL LAI II I	diffDrWheelSpeeds new( double leftVel, double rightVel )				
	X	X		X	X			DiffWheel_Normalize.vi	void normalize( double maxVel )				

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abVIEW Trajectory Library – VI Implementation n 2.X 5/2/2022 – added implicit model follower and time	e intern	olatah <sup>i</sup>	le routi	nes								
- 2.A SIZIZUZZ – added implicit model follower and time	ъ пцегро	ภลเสDI	e routil	ies.	jed Jed							
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	pə	þe	m	,	ž Š	ogre				e W	am	king
	ent	Documente	WPILIB	Item	cution Op	Pro				Revi	ogr	Chec
	plemen	un	Ŋ	ון חר	Execution Toot Bout	Sample				Ť F	t P	Š
	duı	000	Not	Menu	TXeC	San	VI Name	Function Prototype	Notes	S	Tes	Errc
MECANUM DRIVE KINEMATICS		X		X	1		MecaKinematics_New.vi	31				
	X	X		X .	X		MecaKinematics_SetInverseKinematics.vi					
	X	$\frac{X}{V}$	$\rightarrow$		X		MecaKinematics_ToChassisSpeeds.vi					
	X	$\frac{\lambda}{\lambda}$		X	X X		MecaKinematics_ToWheelSpeeds.vi MecaKinematics_ToWheelSpeedsZeroCenter.vi					
							INCCONTRICTOR TOWN COOPECUS ZCIOCCITICI. VI					
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MECANUM DRIVE MOTOR VOLTAGE												
no	thing do	ne										
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	tec	itea	JB	٤ ،	sution Op	Prog				/jev	Irar	170
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	plemente	Documente	* Z	Menu	Execution Toot Bour	or red imple				de	st F	,
	<u> </u>	<u>_</u>	Not WPILIB	<u>χ</u>	Exec	Sa	VI Name	Function Prototype	Notes	8	Test	Eri
MECANUM DRIVE ODOMETRY			X				MecaOdometry_Execute.vi					
	X	X	Χ	X .	X		MecaOdometry_GetKinematics.vi					
	X	$\frac{\lambda}{Y}$		X			MecaOdometry_GetPose.vi MecaOdometry_New.vi					
	X			X			MecaOdometry_NewDefaultPose.vi					
	X	X		Χ			MecaOdometry_Reset.VI					
	X	X		Χ			MecaOdometry_Update.vi					
	X	_X _		X			MecaOdometry_UpdateWithTime.vi					
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MEGANUM DRIVE WILES OFFER	<u> </u>											
MECANUM DRIVE WHEEL SPEEDS	<u> </u>	X			SI F		MecaWheel_New.Vi	frontl oftMetersPerSecond double frontPightMetersPerSecond				
MECANUM DRIVE WHEEL SPEEDS	<u> </u>						Mecavvneel_New.VI	frontLeftMetersPerSecond, double frontRightMetersPerSecond, double rearLeftMetersPerSecond, double				
MECANUM DRIVE WHEEL SPEEDS	S X	X		X	SI			public MecanumDriveWheelSpeeds(double frontLeftMetersPerSecond, double frontRightMetersPerSecond, double rearRightMetersPerSecond)				
MECANUM DRIVE WHEEL SPEEDS	S X	X	X	X .	SI SI		MecaWheel_GetAll.vi	rearRightMetersPerSecond)				
MECANUM DRIVE WHEEL SPEEDS	S X	X	X	X	SI			rearRightMetersPerSecond)  public void normalize(double				
MECANUM DRIVE WHEEL SPEEDS	S X	X	X	X .	SI SI		MecaWheel_GetAll.vi	rearRightMetersPerSecond)				
MECANUM DRIVE WHEEL SPEEDS	S X	X	X	X .	SI SI		MecaWheel_GetAll.vi	rearRightMetersPerSecond)  public void normalize(double				
MECANUM DRIVE WHEEL SPEEDS	S X	X	X	X .	SI SI	am	MecaWheel_GetAll.vi	rearRightMetersPerSecond)  public void normalize(double				
MECANUM DRIVE WHEEL SPEEDS	S X	XXX	X	X X X	SI SI X	ogram	MecaWheel_GetAll.vi	rearRightMetersPerSecond)  public void normalize(double		e w	ue.	kina
MECANUM DRIVE WHEEL SPEEDS	S X X	XXX	X	X	Optimized X	Program	MecaWheel_GetAll.vi	rearRightMetersPerSecond)  public void normalize(double		ie view	ogram	heckina
MECANUM DRIVE WHEEL SPEEDS	S X X	XXX	X	X X X	Optimized X	nple Program	MecaWheel_GetAll.vi	rearRightMetersPerSecond)  public void normalize(double		le Review	t Program	r Checking
MECANUM DRIVE WHEEL SPEEDS	S X	X X X	X	X X X	Optimized X	E	MecaWheel_GetAll.vi MecaWheel_Normalize.vi	public void normalize(double attainableMaxSpeedMetersPerSecond)	Notes	Sode Review	fest Program	error Checking
MECANUM DRIVE WHEEL SPEEDS	Implemented X X X Implemented	Documented X X X	Not WPILIB X	X	SI SI X	E	MecaWheel_GetAll.vi	rearRightMetersPerSecond)  public void normalize(double	Notes For 4 module drives	Code Review	Test Program	Error Checking

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FRC LabVIEW Trajectory Library – VI Implementation Li	st											
Revision 2.X 5/2/2022 – added implicit model follower and time in							0 10 0 10 10 10					
		X		X			SwerveKinematics_NormalizeWheelSpeeds.vi	public static void normalizeWheelSpeeds(SwerveModuleState[] moduleStates, double attainableMaxSpeedMetersPerSecond)				
			X				SwerveKinematics_ToChassisSpeeds4.VI		For 4 module drives			
		Χ		X			SwerveKinematics_ToChassisSpeedsX.VI		uses array as input			
	X	X		X			SwerveKinematics_ToSwerveModuleStates.VI	public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds, Translation2d centerOfRotationMeters)				
	X	Х		X			SwerveKinematics_ToSwerveModuleStatesZeroCenter.VI	public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds)				
								public SwerveDriveKinematics(Translation2d wheelsMeters)	variable parameters (replace with			
								·	array and "4" calls)			
								public ChassisSpeeds toChassisSpeeds(SwerveModuleState wheelStates)	variable parameters (replace with array and "4" calls)			
	Implemented	Documented	Not WPILIB	Menu Item Execution Optimized	Test Routine	-,	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
SWERVE DRIVE ODOMETRY							SwerveOdometry_Execute4.vi					
							SwerveOdometry_ExecuteX.vi					
	X			X			SwerveOdometry_GetPosition.VI	public Pose2d getPoseMeters()				
		X		X			SwerveOdometry_New.VI	public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose)				
		X		X			SwerveOdometry_NewZeroCenter.VI	public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle)				
	X			X			SwerveOdometry_ResetPosition.VI	public void resetPosition(Pose2d pose, Rotation2d gyroAngle)				
		Χ		X			SwerveOdometry_Update4.VI		For 4 module drives			
		Χ		X			SwerveOdometry_UpdateWithTime4.VI		For 4 module drives			
				Χ			SwerveOdometry_UpdateWithTimeX.VI		uses array as input			
	X	X	X	X			SwerveOdometry_UpdateX.VI	public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates)	uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with array and "4" calls)			
	X Implem	X Documented	Not W	X X Menu Item S S S S S S S S S S S S S S S S S S S	Test Routi		VI Name SwerveModuleState_CompareTo.vi SwerveModuleState_Get.vi SwerveModuleState_New.vi SwerveModuleState_Optimize.vi	Function Prototype public int compareTo(SwerveModuleState o)  public SwerveModuleState(double speedMetersPerSecond, Rotation2d angle) public SwerveModuleState optimize( SwerveModuleState desired, Rotation2d angle )	Notes	Code Review	Test Program	Error Checking
 SPLINE '=======				ō.								
	nplemented	Documented	Z	enu Item xecution Optimize	Test Routine	ample Program				ode Review	əst Program	ror Checking
<u> </u>	1	Ğ	Not	Ž Ŭ	76	Saı	VI Name	Function Prototype	Notes	ŏ		<u> </u>
		Х		X			CubicHermiteSpline_getControlVectorFromArrays.vi	private SimpleMatrix getControlVectorFromArrays( double[] initialVector, double[] finalVector)	not needed, use cluster unpack			
	X	X		X			CubicHermiteSpline_makeHermiteBasis.vi	private SimpleMatrix makeHermiteBasis()				

	interp											
	X	X		X			CubicHermiteSpline_New.vi	public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector)				
POSE WITH CURVATURE	X Implemented	X Documented	Not WPILIB	X Menu Item	9 Execution Optimized	Test Routine	W VI Name  PoseWithCurve_New.vi	Function Prototype  public PoseWithCurvature(Pose2d poseMeters, double curvatureRadPerMeter) public PoseWithCurvature() public Pose2d poseMeters	Notes  can use cluster constant not needed, use cluster unpack	Code Review	Test Program	Error Checking
				Ĺ				public double curvatureRadPerMeter	not needed, use cluster unpack			
QUINTIC HERMITE SPLINE	X Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine	VI Name  QuinticHermiteSpline_getControlVectorFromArrays.vi  QuinticHermiteSpline makeHermiteBasis.vi	Function Prototype  private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector)  private SimpleMatrix makeHermiteBasis()	Notes	Code Review	Test Program	Error Checking
	X	X		X			QuinticHermiteSpline_makenermiteBasis.vi QuinticHermiteSpline_New.vi	public QuinticHermiteSpline(double[] xInitialControlVector,				<u> </u>
,							Quinto io i i i i i i i i i i i i i i i i i	double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector)  protected SimpleMatrix getCoefficients()	not needed, use cluster unpack			
SPLINE (Abstract class)∫	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimiz	Test Routine	Sample Program	Evention Devictors	Notes	Code Review	Test Program	or Checking
SELINE (ADSII act class)	X	X	_<_		EXE	Test		Function Prototype public PoseWithCurvature getPoint(double t)		<u></u>		Error
SPEINE (Abstract class)	X	X	_<	X	Exe	Test	Spline_getPoint.vi	public PoseWithCurvature getPoint(double t) Spline(int degree)		Ö	Ĕ	Errc
SPEINE (Abstract class)	X	X	_<		Exe	Test		public PoseWithCurvature getPoint(double t) Spline(int degree) public static class ControlVector		Ö	Ĕ	Errc
SPLINE (Abstract class)				X X	Optimized	Routine	Spline_getPoint.vi	public PoseWithCurvature getPoint(double t) Spline(int degree) public static class ControlVector public ControlVector(double[] x, double[] y)	implemented as data structure		est Program	· Checking
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized		Spline_getPoint.vi	public PoseWithCurvature getPoint(double t) Spline(int degree) public static class ControlVector public ControlVector(double[] x, double[] y)  Function Prototype		Code Review	·	
SPLINE (Abstract class)	X Implemented	X Documented	Not WPILIB	X Wenu Item	Optimized	Routine	Spline_getPoint.vi  ### Spline    ### VI Name  SplineHelp_GetCubicCtrlVector.vi  SplineHelp_GetCubicCtrlVectorsFromWayPts.vi	public PoseWithCurvature getPoint(double t) Spline(int degree) public static class ControlVector public ControlVector(double[] x, double[] y)  Function Prototype private static Spline.ControlVector getCubicControlVector(double scalar, Pose2d point) public static Spline.ControlVector[] getCubicControlVectorsFromWaypoints( Pose2d start, Translation2d[] interiorWaypoints, Pose2d end )	implemented as data structure		·	· Checking
	X   mplemented	X Documented	Not WPILIB	X Wenu Item	Execution Optimized	Test Routine	Spline_getPoint.vi  ### Spline    ### VI Name  SplineHelp_GetCubicCtrlVector.vi  SplineHelp_GetCubicCtrlVectorsFromWayPts.vi  SplineHelp_GetCubicCtrlVectorsFromWeightedWayPts.vi	public PoseWithCurvature getPoint(double t) Spline(int degree) public static class ControlVector public ControlVector(double[] x, double[] y)  Function Prototype private static Spline.ControlVector getCubicControlVector(double scalar, Pose2d point) public static Spline.ControlVector[] getCubicControlVectorsFromWaypoints( Pose2d start, Translation2d[] interiorWaypoints, Pose2d end )	implemented as data structure  Notes		·	· Checking
	X   X   X   X   X   X   X   X   X   X	X Documented	X X Not WPILIB	X X No	Execution Optimized	Test Routine	Spline_getPoint.vi  ### Spline_getPoint.vi  ### VI Name  SplineHelp_GetCubicCtrlVector.vi  SplineHelp_GetCubicCtrlVectorsFromWayPts.vi  SplineHelp_GetCubicCtrlVectorsFromWeightedWayPts.vi  SplineHelp_GetCubicSpline_Calc1.vi	public PoseWithCurvature getPoint(double t) Spline(int degree) public static class ControlVector public ControlVector(double[] x, double[] y)  Function Prototype private static Spline.ControlVector getCubicControlVector(double scalar, Pose2d point) public static Spline.ControlVector[] getCubicControlVectorsFromWaypoints( Pose2d start, Translation2d[] interiorWaypoints, Pose2d end )	implemented as data structure  Notes  internal		·	· Checking
	X   mplemented	X Documented X X X X	X X X Not WPILIB	X Wo No	Execution Optimized	Test Routine	Spline_getPoint.vi  ### Spline_getPoint.vi  ### VI Name  SplineHelp_GetCubicCtrlVector.vi  SplineHelp_GetCubicCtrlVectorsFromWayPts.vi  SplineHelp_GetCubicCtrlVectorsFromWeightedWayPts.vi  SplineHelp_GetCubicSpline_Calc1.vi  SplineHelp_GetCubicSpline_Calc2.vi	public PoseWithCurvature getPoint(double t) Spline(int degree) public static class ControlVector public ControlVector(double[] x, double[] y)  Function Prototype private static Spline.ControlVector getCubicControlVector(double scalar, Pose2d point) public static Spline.ControlVector[] getCubicControlVectorsFromWaypoints( Pose2d start, Translation2d[] interiorWaypoints, Pose2d end )	implemented as data structure  Notes		·	· Checking
	X   X   X   X   X   X   X   X   X   X	X Documented X X X X	X X X Not WPILIB	X Wo No	Execution Optimized	Test Routine	Spline_getPoint.vi  ### Spline_getPoint.vi  ### VI Name  SplineHelp_GetCubicCtrlVector.vi  SplineHelp_GetCubicCtrlVectorsFromWayPts.vi  SplineHelp_GetCubicCtrlVectorsFromWeightedWayPts.vi  SplineHelp_GetCubicSpline_Calc1.vi	public PoseWithCurvature getPoint(double t) Spline(int degree) public static class ControlVector public ControlVector(double[] x, double[] y)  Function Prototype private static Spline.ControlVector getCubicControlVector(double scalar, Pose2d point) public static Spline.ControlVector[] getCubicControlVectorsFromWaypoints( Pose2d start, Translation2d[] interiorWaypoints, Pose2d end )	implemented as data structure  Notes  internal internal internal		·	· Checking

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Revision 2.X 5/2/2022 – added implicit model follow	wer and time <u>in</u>	terpol	atable ro	utines								
	_						SplineHelp_GetQuinticCtrlVectorsFromWayPts.vi	public static List <spline.controlvector> getQuinticControlVectorsFromWaypoints( List<pose2d> waypoints )</pose2d></spline.controlvector>	REMOVED 2762			
							SplineHelp_GetQuinticCtrlVectorsFromWeightedWayPts.vi	waypoints j	REMOVED 2762			
		Χ .	X	X			SplineHelp_getQuinticSplinesFromControlVectors.vi	public static QuinticHermiteSpline[] getQuinticSplinesFromControlVectors( Spline.ControlVector[] controlVectors)				
		X .	XX	X			SplineHelp_GetQuinticSplinesFromWeightedWayPts.vi	John Gry Gotoro)	New 2762			
			X	X			SplineHelp_GetQuinticSplinesFromWayPts.vi		New 2762			
			X	No			SplineHelp_ThomasAlgorithm.vi	private static void thomasAlgorithm(double[] a, double[] b, double[ c, double[] d, double[] solutionVector)	internal			
		mplemented	cumented t WPILIB	Menu Item	Execution Optimized	Test Routine Sample Program				de Review	st Program	or Checking
		Ė	Not Doc	Me	ŭ	7es Sai	VI Name	Function Prototype	Notes	Š	je Je	Er
SPLINE PARAM		X .	X	X			SplineParam_Spline_T0_T1.vi	public static List <posewithcurvature> parameterize(Spline spline double t0, double t1)</posewithcurvature>	,			
			X	X		X	SplineParam_Spline.vi	public static List <posewithcurvature> parameterize(Spline spline</posewithcurvature>				
				No			SplineParam_StackGet.vi		internal			
				No			SplineParam_StackPop.vi		internal			
		Χ .	X X	No			SplineParam_StackPush.vi		internal			
TRAJECTORY '========					nized	<i>و</i>						
		nplemented	Documented Not WPILIB	Menu Item	Execution Optin	Test Routine Sample Prograr	VI Name	Function Prototype	Notes	ode Review	Test Program	Error Checking
ТР		= '	X   <	<u>≥</u>		<u></u> ν	Trajectory_Concatenate.vi	Function Frototype	Notes	<u> </u>		
			X	X			Trajectory_equals.vi	boolean equals( other obj )	FUTURE			
			X		SI		Trajectory_GetStates.vi	public List <state> getStates()</state>	not needed, use unpack			
			X	X			Trajectory GetTotalTime.vi	public double getTotalTimeSeconds()	not needed, use unpack		+	
			X	No			Trajectory_lerp_double.vi	private static double lerp(double startValue, double endValue, double t)	internal			
			X		SI		Trajectory_lerp_Pose.vi	private static Pose2d lerp(Pose2d startValue, Pose2d endValue, double t)	internal			
			X		SI		Trajectory_New_Empty.vi	11: T : 1 (5 11:1:0:1: 1 )				
			X X	X	SI		Trajectory_New.vi Trajectory_RelativeTo.vi	public Trajectory(final List <state> states) public Trajectory relativeTo(Pose2d pose)</state>	+			
			X	X			Trajectory_Relative Lo.vi Trajectory_Sample.vi	public Trajectory relative ro(Pose2d pose) public State sample(double timeSeconds)	+ +	$\longrightarrow$	$\longrightarrow$	
			$\begin{array}{c c} x & x \\ \hline \end{array}$				Trajectory_SampleReverse.vi	public state sample(double timeseconds)	Sample in reverse order. Negate sample.			
		X .	X	X			Trajectory_TransformBy.vi	public Trajectory transformBy(Transform2d transform)	sample.			1
								public Pose2d getInitialPose()	can use cluster unpack, array index			
		mplemented	umented WPILIB	Menu Item	Execution Optimized	Test Routine Sample Program				e Review	. Program	r Checking
		gr.	Not Docu	1en	š.	est am	VI Name	Function Prototype	Notes	ροχ	est	īro
TDA IECTO			<u> </u>	_ ≥ 	SI	<u> </u>	TrajectoryState_Equals.vi	boolean equals( other obj )	INOTES			
INAJECTO	ZKI_OIAIL	$\hat{X}$	X X				TrajectoryState_Equals.vi	poologii oqualo( otiloi obj )	+ +			
			$\frac{x}{x}$		SI		TrajectoryState_GetPose.vi					
		X	X	X			TrajectoryState Interpolate.vi	State interpolate(State endValue, double i)				
			-				· · · · · · · · · · · · · · · · · · ·					

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FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines TrajectoryState New.vi public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State() Q ltem Test Function Prototype VI Name Notes TRAJECTORY CONFIG X public TrajectoryConfig(double maxVelocityMetersPerSecond, SI TrajectoryConfig Create.vi double maxAccelerationMetersPerSecondSq) XX X Χ SI TrajectoryConfig\_setCentripetalAccel.vi Χ X SI TrajectoryConfig\_setKinematicsDiffDrive.vi public TrajectoryConfig setKinematics(DifferentialDriveKinematics kinematics) Χ SI FrajectoryConfig setKinematicsMecanumfDrive.vi public TrajectoryConfig setKinematics(MecanumDriveKinematics Χ X kinematics)  $X \mid X$ Χ SI TrajectoryConfig\_setKinematicsSwerveDrive.vi public TrajectoryConfig setKinematics(SwerveDriveKinematics kinematics) SI TrajectoryConfig\_setReversed.vi public TrajectoryConfig setReversed(boolean reversed) XX Χ X X X X SI TrajectoryConfig\_setVoltageDiffDrive.vi public TrajectoryConfig addConstraint(TrajectoryConstraint Implemented differently, can't constraint) duplicate. public TrajectoryConfig addConstraints(List<? extends Implemented differently, can't TrajectoryConstraint> constraints) duplicate public double getStartVelocity() can use cluster unpack public TrajectoryConfig setStartVelocity(double startVelocityMetersPerSecond) public double getEndVelocity() can use cluster unpack public TrajectoryConfig setEndVelocity(double endVelocityMetersPerSecond) public double getMaxVelocity() can use cluster unpack public double getMaxAcceleration() can use cluster unpack public List<TrajectoryConstraint> getConstraints() Implemented differently, can't duplicate. public boolean isReversed() can use cluster unpack NOTE ADD OTHER "SET" ROUTINES FOR OTHER CONTRAINTS HERE, SINCE NEW CONTRAINTS ARE SPECIFIC AND NOT GENERIC. Menu Item Λot VI Name Function Prototype Notes TRAJECTORY GENERATE X public static Trajectory generateTrajectory( Spline.ControlVector initial, List<Translation2d> interiorWaypoints, Spline.ControlVector FrajectoryGenerate Make Cubic CtrlVect.vi uses cubic splines end, TrajectoryConfig config )
public static Trajectory generateTrajectory( Pose2d start, TrajectoryGenerate Make Cubic.vi Χ uses cubic splines Χ List<Translation2d> interiorWaypoints, Pose2d end, TrajectoryConfig config )

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Helper to bring these all together.

controlVectors, TrajectoryConfig config)

waypoints, TrajectoryConfig config)

public static List<PoseWithCurvature> splinePointsFromSplines(Spline[] splines)

public static Trajectory generateTrajectory( ControlVectorList

public static Trajectory generateTrajectory(List<Pose2d>

Use this one!!!

New 2762

uses quintic splines

uses quintic splines

TrajectoryGenerate Make Generic.vi

TrajectoryGenerate Make Quintic.vi

TrajectoryGenerate Make Quintic CtrlVect.vi

TrajectoryGenerate Make Quintic Weighted.vi

TrajectoryGenerate splinePointsFromSplines.vi

FRC LabVIEW Trajectory Library – VI Implementation	List												
Revision 2.X 5/2/2022 – added implicit model follower and time	e inter	rpolata	ble rou	ıtines.	_								
TRAJECTORY GENERATE (Control Vector	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype public ControlVectorList(int initialCapacity)	Notes may not need, just data	Code Review	Test Program	Error Checking
									public ControlVectorList()	may not need, just data			
					,				public ControlVectorList(Collection extends Spline.ControlVector collection)	may not need, just data			
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine		VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
TRAJECTORY PARAMETERIZE				No				TrajectoryParam_calcStuffFwd.vi					
	X X	X	X	No No No				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			
			^\	110						when new constraints are added.			
	X	X		X				TrajectoryParam_timeParam.vi	public static Trajectory timeParameterizeTrajectory( List <posewithcurvature> points. List<trajectoryconstraint> constraints, double startVelocityMetersPerSecond, double endVelocityMetersPerSecond, double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq, boolean reversed)</trajectoryconstraint></posewithcurvature>				
TRAJECTORY PARAMETERIZE CONSTRAINED STATE	X X X	X	X X X	X	d Execution Optimized	Test Routine		VI Name ConstrainedState_New.vi  ConstrainedState_SetMaxAccel.vi ConstrainedState_SetMinAccel.vi ConstrainedState_SetVelAccel.vi ConstrainedState_SetVelocity.vi	Function Prototype  ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double maxAccelerationMetersPerSecondSq)  ConstrainedState()	Notes	Code Review	Test Program	Error Checking
TRAJECTORY UTIL	X X / Implemented	X	X X Not WPILIB	X X Menu Item	X X Execution Optimized	Test Routine		VI Name TrajectoryUtil_fromPathWeaverJSON.vi TrajectoryUtil_MakeWeightedWayPoint_ENG.vi TrajectoryUtil_MakeWeightedWayPoint.vi TrajectoryUtil_toPathWeaverJSON.vi	Function Prototype  public static Trajectory fromPathweaverJson(Path path)  public static void toPathweaverJson(Trajectory trajectory, Path path)	Notes	Code Review	Test Program	Error Checking
									public static Trajectory deserializeTrajectory(String json)				
									public static String serializeTrajectory(Trajectory trajectory)				

TRAPEZOID PROFILE	X X X X X X X X X X X X X X X X 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	्र हिस्टिपारं Optimized	Test Routine		Function  TrapProfConstraint_New.vi  TrapProfile_Calculate.vi  TrapProfile_Direct.vi  TrapProfile_Execute.vi  TrapProfile_Execute_AtGoal.vi  TrapProfile_IsFinished.vi  TrapProfile_New_DefInitial.vi  TrapProfile_New.vi  TrapProfile_ShouldFlipAcceleration.vi  TrapProfile_TimeLeftUntil.vi  TrapProfile_TotalTime.vi  TrapProfState_Equals.vi  TrapProfState_New.vi		Notes  Private, remove from menu  Private, remove from menu
'======= TRAJECTORY CONSTRAINT										
CENTRIPETAL ACCELERATION CONSTRAINT	X Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine		CentripetalAccelConstraint_getMaxVelocity.vi public doi poseMete	Prototype  buble getMaxVelocityMetersPerSecond(Pose2d  ers, double curvatureRadPerMeter, double  MetersPerSecond)	Notes
	X	X		X				CentripetalAccelConstraint_getMinMaxAccel.vi public Min getMinMa double cu	inMax axAccelerationMetersPerSecondSq(Pose2d poseMeters, urvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X	SI			CentripetalAccelConstraint_New.vi public Ce maxCentri	entripetalAccelerationConstraint(double tripetalAccelerationMetersPerSecondSq)	Can use cluster pack for now
DIFF DRIVE KINEMATIC CONSTRAINT	X   mplemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine		DiffDriveKinematicsConstraint_getMaxVelocity.vi public doi poseMete velocityM  DiffDriveKinematicsConstraint_getMinMaxAccel.vi public Mir	ouble getMaxVelocityMetersPerSecond(Pose2d ers, double curvatureRadPerMeter, double detersPerSecond)	Notes
					0.1			double cu	axAccelerationMetersPerSecondSq(Pose2d poseMeters, urvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X	SI			Differentia	fferentialDriveKinematicsConstraint(final ialDriveKinematics kinematics, double edMetersPerSecond)	
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	/I Name Function	Prototype	Notes

'=========

TRAJECTORY CONSTRAINT (Min Max)

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X SI

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Constraint MinMax New.vi

Constraint MinMax NewMinMax.VI

Function Prototype

Constraint MinMax New

Constraint MinMax New

Notes

UTILITY '========

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
UTIL		Χ	Χ	X	SI			Util ApproxEqual.vi		
	Χ	Χ	Χ	X				Util_Array_PoseWCurv_to_XY.vi		
	Χ	Χ	Χ	X	SI			Util CalcDist.vi		
	Χ	Χ	Χ	X	SI			Util_GetLibraryVersion.vi		
	Χ	Χ	Χ	Χ	SI			Util_GetLibUsage.vi		
	Χ	X	X	Χ				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	Χ	Χ				Util_Trajectory_Absolute_To_Relative.vi		
	Χ	Χ	Χ	Χ				Util_Trajectory_ReadFile.vi		
	Χ	Χ	Χ	X				Util_Trajectory_to_XY.vi		
	Χ	Χ	X	No				Util_Trajectory_WriteFile_Config.vi		internal
	Χ	Χ	Χ	No				Util_Trajectory_WriteFile_OneState.vi		internal
	Χ	Χ	X	Χ				Util_Trajectory_WriteFile_PathFinder.vi		
	Χ	Χ	Χ	No				Util_Trajectory_WriteFile_PathFinderConfig.vi		internal
	Χ	Χ	Χ	Χ				Util_Trajectory_WriteFile_Pathweaver.vi		
	Χ	Χ	X	No				Util_Trajectory_WriteFile_States.vi		internal
	Χ	Χ	X	No				Util_Trajectory_WriteFile_WayPoints.vi		internal
	Χ	Χ	X	Χ				Util_Trajectory_WriteFile.vi		
	Χ	Χ	X	X				Util_TrajectoryState_Meters_To_Inches.vi		
	Χ	Χ	X	Χ				Util_TrajState_to_DiffDrive_WheelPos.vi		
	Χ	Χ	X	Χ				Util_DispWaypoint_Eng_To_SI.vi		
	Χ	Χ	X	X				Util_DispWaypoint_To_CubicInput.vi		
	Χ	Χ	X	Χ				Util_DispWaypoint_To_QuinticInput.vi		
	Χ	Χ	X	X				Util_DispWeightedWaypiont_Eng_To_WeightedWaypoint		
	Χ	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 Optimized	Test Routine Sample Program	VI Name	Function Prototype	Notes
CONV	Χ	Χ	X	X	SI		Conv_AngleDegrees_Heading.vi		
	Χ	Χ	Χ	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	Χ	Χ	SI		Conv_Deg_Rotations.vi		
	Χ	Χ	Χ	Χ	SI		Conv_Feet_Meters.vi		
	Χ	Χ	Χ	X	SI		Conv_GyroDegrees_Heading.vi		
	Χ	Χ	Χ	X	SI		Conv_Heading_AngleRadians.vi		
	Χ	Χ	Χ	X	SI		Conv_Inches_Meters.vi		
	Χ	Χ	Χ	X	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	X	Χ	SI		Conv_Pounds_Kilograms.vi		

 i itoi p	Joiatab	no rou	ui ico.		
Χ	X	Χ	X	SI	Conv_Radians_Deg.vi
Χ	X	Χ	Χ	SI	Conv_Radians_Rotations.vi
Χ	X	Χ	Χ	SI	Conv_Rotations_Deg.vi
Χ	X	Χ	X	SI	Conv_Rotations_Radians.vi
Χ	X	X	X	SI	Conv Yards Meters.vi

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

'======= PATHFINDER UTIL

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

VI Name Function Prototype Notes PathfinderUtil\_Continuous\_Heading\_Difference.vi PathfinderUtil\_OptimizeTrajectoryStates.vi PathfinderUtil\_ToTrajectory.vi PathfinderUtil\_ToTrajectoryStates.vi

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

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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program In Management of the Program	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					
	Χ	X		Χ	SI		DCMotor_GetBag.vi					
	Χ	X		X	SI		DCMotor_GetBanebotsRs550.vi					
	Χ	Χ		X	SI		DCMotor_GetBanebotsRs775.vi					
	Χ	Χ		Χ	SI		DCMotor_GetCIM.vi					
	X	X		X	SI		DCMotor GetCurrent.vi					

ime interp	olalable fol	unes.			
X	X	X	SI	DCMotor_GetFalcon500.vi	
X	X	X	SI	DCMotor_GetMiniCIM.vi	
X	X	X	SI	DCMotor_GetNEO.vi	
X	X	X	SI	DCMotor_GetNEO550.vi	
X	X	X	SI	DCMotor_GetNEO550.vi DCMotor_GetRomiBuiltIn.vi DCMotor_GetVex775Pro.vi	
X	X	X	SI	DCMotor_GetVex775Pro.vi	
X	X	X	SI	DCMotor_New.vi	
X	X	X	SI	DCMotor_PickMotor.vi	

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

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE POSE ESTIMATOR	Χ	Χ		Χ				DiffDrivePoseEst_AddVisionMeasurement.vi					
	Χ	Χ		X			+	DiffDrivePoseEst_FillStateVector.vi					
	Χ	Χ		X				DiffDrivePoseEst_GetEstimatedPosition.vi					
	Χ	Χ		Χ				DiffDrivePoseEst_Kalman_F_Callback.vi					
	Χ	Χ		X				DiffDrivePoseEst_Kalman_H_Callback.vi					
	X	Χ		X				DiffDrivePoseEst_New.vi					
	X	Χ		X				DiffDrivePoseEst_ResetPosition.vi					
	Χ	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 Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
EXTENDED KALMAN FILTER	Χ	X		Χ			ExtendedKalmanFilter_Correct_OnlyUY.vi					
	Χ	X		Χ			ExtendedKalmanFilter_Correct.vi		Just a shell, not func	tional!		
	Χ	Χ		Χ			ExtendedKalmanFilter_GetP_Single.vi					
	Χ	Χ		Χ			ExtendedKalmanFilter_GetP.vi					
	Χ	Χ		Χ			ExtendedKalmanFilter_GetXHat_Single.vi					
	Χ	X		Χ			ExtendedKalmanFilter GetXHat vi					

vision 2.X 5/2/2022 – added implicit model follower and time		oolatabl		es. K			ExtendedKalmanFilter New.vi					
	X	X		Υ .			ExtendedKalmanFilter Predict.vi					
	X	X	λ	<b>(</b>			ExtendedKalmanFilter_Reset.vi					
	X	X		Υ			ExtendedKalmanFilter_SetP.vi					
				Υ			ExtendedKalmanFilter_SetXHat_Single.vi ExtendedKalmanFilter_SetXHat.vi					
	X	X	X	Χ			ExtendedKalmanFilter_SetXHat.vi					
				7	7							
				į. izi		'am						g
	ted	pə;	, 19	્ ર્ટ	je g	rogi				iew	ram	ckir
	nplemente	ieni	PIL.		Lxecution of Test Routine	e D				Sev.	rog	She
	olen	cnu	Not WPIL	2 6	T IX	nple				qe I	# D	o' (
	=	Do	No	)   			VI Name	Function Prototype	Notes	Ŝ	7e.	Err
KALMAN FILTER			λ		X		KalmanFilter_Correct.vi					
	X			Υ			KalmanFilter_GetK					
				<b>Υ</b>			KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat					
	X	$\frac{\lambda}{X}$		Υ	X		KalmanFilter_GetXHaT_Single					
				· ·	X		KalmanFilter New.vi					
				<	X		KalmanFilter_Predict.vi					
		Χ		<b>(</b>			KalmanFilter_Reset.vi					
				Υ			KalmanFilter_SetXHat					
	X	$\stackrel{X}{\vdash}$	X	Υ	X		KalmanFilter_SetXHat_Single					
KALMAN FILTER LATENCY COMPENSATOR	X Implemented	X Documented	Not WPILIB		Test Routine		VI Name  KalmanFilterLatencyComp_AddObserverState.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	X	X	χ				KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi					
	X	X	7	Υ			   KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.vi					
	X	X	X	X .			KalmanFilterLatencyComp_FindClosestMeasurement.vi					
	X	X	, ×	<b>Υ</b>			KalmanFilterLatencyComp_New.vi KalmanFllterLatencyComp_Observer_New.vi					
	X	$\frac{\lambda}{X}$		χ			KalmanFilterLatencyComp_Observer_rew.vi					
							realitable into Editorio y Comp_1000t. Vi			I		
	<i>p</i> e.	ted	g ,	Ortimita	)e	ogram				iew	gram	checking
	lement	neur	WPIL!	ila lieu.	t Routir	nple Pr				fe Rev	it Pro	χ
	Implement	Documen	Not WPILI	Mend nem	Test Routin	Sample Pr	VI Name	Function Prototype	Notes	Code Rev	Test Pro	Error C
MECANUM DRIVE POSE ESTIMATOR		Documen			Test Routir		MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi	Function Prototype	Notes	Code Rev	Test Pro	Error C
MECANUM DRIVE POSE ESTIMATOR	Χ	Documen	X	X X	Test Routin		MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi MecaDrivePoseEst_AddVisionMeasurement.vi	Function Prototype	Notes	Code Rev	Test Pro	Error C
MECANUM DRIVE POSE ESTIMATOR	X	X	X	X X	Test Routii		MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi MecaDrivePoseEst_AddVisionMeasurement.vi MecaDrivePoseEst_GetEstimatedPosition.vi	Function Prototype	Notes	Code Rev	Test Pro	Error C
MECANUM DRIVE POSE ESTIMATOR	X X X	X	X X	X Io	Test Routii		MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi MecaDrivePoseEst_AddVisionMeasurement.vi MecaDrivePoseEst_GetEstimatedPosition.vi MecaDrivePoseEst_Kalman_F_Callback.vi	Function Prototype	Notes	Code Rev	Test Pro	Error C
MECANUM DRIVE POSE ESTIMATOR	X X X	X X X	X X N	X X IIo	Test Routii		MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi MecaDrivePoseEst_AddVisionMeasurement.vi MecaDrivePoseEst_GetEstimatedPosition.vi MecaDrivePoseEst_Kalman_F_Callback.vi MecaDrivePoseEst_Kalman_H_Callback.vi	Function Prototype	Notes	Code Rev	Test Pro	Error C
MECANUM DRIVE POSE ESTIMATOR	X X X X	X X X X	X X N N	X III	Test Routii		MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi MecaDrivePoseEst_AddVisionMeasurement.vi MecaDrivePoseEst_GetEstimatedPosition.vi MecaDrivePoseEst_Kalman_F_Callback.vi MecaDrivePoseEst_Kalman_H_Callback.vi MecaDrivePoseEst_New.vi	Function Prototype	Notes	Code Rev	Test Pro	Error C
MECANUM DRIVE POSE ESTIMATOR	X X X X X X	X X X X X	X	XX III III III III III III III III III	Test Routin		MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi MecaDrivePoseEst_AddVisionMeasurement.vi MecaDrivePoseEst_GetEstimatedPosition.vi MecaDrivePoseEst_Kalman_F_Callback.vi MecaDrivePoseEst_Kalman_H_Callback.vi MecaDrivePoseEst_New.vi MecaDrivePoseEst_ResetPosition.vi MecaDrivePoseEst_SetVisionMeasurementStdDevs.vi	Function Prototype	Notes	Code Rev	Test Pro	Error C
MECANUM DRIVE POSE ESTIMATOR	X X X X X X	X X X X X X	X	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	Test Routin		MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi MecaDrivePoseEst_AddVisionMeasurement.vi MecaDrivePoseEst_GetEstimatedPosition.vi MecaDrivePoseEst_Kalman_F_Callback.vi MecaDrivePoseEst_Kalman_H_Callback.vi MecaDrivePoseEst_New.vi MecaDrivePoseEst_ResetPosition.vi MecaDrivePoseEst_SetVisionMeasurementStdDevs.vi MecaDrivePoseEst_Update.vi	Function Prototype	Notes	Code Rev	Test Pro	Error C
MECANUM DRIVE POSE ESTIMATOR	X X X X X X X X	X X X X X X X	X	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	Test Routii		MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi MecaDrivePoseEst_AddVisionMeasurement.vi MecaDrivePoseEst_GetEstimatedPosition.vi MecaDrivePoseEst_Kalman_F_Callback.vi MecaDrivePoseEst_Kalman_H_Callback.vi MecaDrivePoseEst_New.vi MecaDrivePoseEst_ResetPosition.vi MecaDrivePoseEst_SetVisionMeasurementStdDevs.vi MecaDrivePoseEst_Update.vi MecaDrivePoseEst_Update.vi	Function Prototype	Notes	Code Rev	Test Pro	Error C
MECANUM DRIVE POSE ESTIMATOR	X X X X X X X X	X X X X X X X X	X	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	Test Routin		MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi MecaDrivePoseEst_AddVisionMeasurement.vi MecaDrivePoseEst_GetEstimatedPosition.vi MecaDrivePoseEst_Kalman_F_Callback.vi MecaDrivePoseEst_Kalman_H_Callback.vi MecaDrivePoseEst_New.vi MecaDrivePoseEst_ResetPosition.vi MecaDrivePoseEst_SetVisionMeasurementStdDevs.vi MecaDrivePoseEst_Update.vi	Function Prototype	Notes	Code Rev	Test Pro	Error C

SWERVE DRIVE POSE ESTIMATOR	Implemented	Documented	Not WPILIB		Execution Optimized	Test Routine	VI Name Function Prototype  SwerveDrivePoseEst AddVisionMeasurement StdDev.vi	Notes	Code Review	Test Program	Error Checking
SWERVE BRIVE FOOL ESTIMATOR	X	X		Х			SwerveDrivePoseEst_AddVisionMeasurement.vi				
	X	X		X X			SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst Kalman F Callback.vi				
		$\hat{X}$		X			SwerveDrivePoseEst_Kalman_H_Callback.vi				
	X	Χ		X			SwerveDrivePoseEst_New.vi				
	X	X X		X X			SwerveDrivePoseEst_ResetPosition.vi SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi				
	$\hat{x}$	$\hat{x}$		X			SwerveDrivePoseEst_Update.vi				
	X	X		X			SwerveDrivePoseEst_UpdateWithTime.vi				
	X	X		X X			SwerveDrivePoseEst_VisionCorrect_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi				
	^	^		^			SwerveDriveFoseEst_visionCorrect_Raiman_n_Caliback.vi				
UNSCENTED KALMAN FILTER	X X X X X X X X X X X X X X X X X X X	X			Execution Optimized	Test Routine Sample Program	VI Name  UnscentedKalmanFilter_Correct_FuncGroup.vi  UnscentedKalmanFilter_Correct_OnlyUY.vi  UnscentedKalmanFilter_Correct_OnlyUYR.vi  UnscentedKalmanFilter_Gerect_OnlyUYR.vi  UnscentedKalmanFilter_GetP_Single.vi  UnscentedKalmanFilter_GetP_Single.vi  UnscentedKalmanFilter_GetXHat_Single.vi  UnscentedKalmanFilter_GetXHat.vi  UnscentedKalmanFilter_New_Default.vi  UnscentedKalmanFilter_New_FuncGroup.vi  UnscentedKalmanFilter_New.v.  UnscentedKalmanFilter_New.v.  UnscentedKalmanFilter_SetXHat_Single.vi  UnscentedKalmanFilter_SetV.vi  UnscentedKalmanFilter_SetV.vi  UnscentedKalmanFilter_SetV.vi  UnscentedKalmanFilter_SetV.vi  UnscentedKalmanFilter_SetXHat_Single.vi  UnscentedKalmanFilter_SetXHat_Single.vi  UnscentedKalmanFilter_SetXHat_vi  UnscentedKalmanFilter_SetXHat.vi  UnscentedKalmanFilter_Transform.vi	Notes	Code Review	Test Program	Error Checking
'======= STATE SPACE CONTROL											
'========											
CONTROL AFFINE DI ANT UN FEDERAL FEEDERS	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine 	VI Name Function Prototype	Notes	Code Review	Test Program	Error Checking
CONTROL AFFINE PLANT INVERSION FEEDFORWARD											

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.X 5/2/2022 – added implicit model follower and tin	ne inter	polatal	ble rou	tines.	Ø							
	   Implemented	Documented	Not WPILIB	Menu Item	Execution Optimize	Test Routine	Sample Program NI Name	Function Prototype	Notes	Code Review	Test Program	i i
DIFFERENTIAL DRIVE ACCELERATION LIMITE	$\frac{\mathbf{R}}{X}$		<del> </del>	X		X	DiffDrvAccelLimit_Calculate.vi DiffDrvAccelLimit_New.vi					
	nted	ited		tem >	ion Optimized		EmployAccelLimit_idew.vi			Review	rogram	1
IMPLICIT MODEL FOLLOWE	K Impleme	Documer	Not WP	X Menu I	Execution	X Test Routine	ଓ VI Name ImplModelFollow Calculate.vi	Function Prototype	Notes	Code F	Test P.	
= 333 33== 1 3== 31	X			Χ		X	ImplModelFollow_GetU.vi					
	Χ			Χ		Χ	ImplModelFollow_GetU_Single.vi					
	X		<del> </del>	X		X	ImplModelFollow_New.vi					
	X	_		X		X	ImplModelFollow_New_Plant.vi ImplModelFollow Reset.vi					
	nplementec	Documentec	Vot WPILIB	Menu Item	Execution O	Test Routine	ର NI Name ମୁନ୍ଦି	Function Prototype	Notes	2ode Reviev	Test Prograi	
LINEAR PLANT INVERSION FEEDFORWAR	ם <u>צ</u>			_ <u>≥</u>   <i>X</i>		$\vdash$	LinearPIntInvFF_Calculate_NextR.vi	Function Prototype	Notes		<u> </u>	
	X		+	X			LinearPIntInvFF Calculate.vi					
	Χ			Χ		$\Box$	LinearPIntInvFF_GetR_Single.vi					
	X	_		X		$\rightarrow$	LinearPIntInvFF_GetR.vi LinearPIntInvFF_GetUff_Single.vi					
	X			X			LinearPIntInvFF_GetUff.vi					
	X	X		Χ			LinearPIntInvFF_New_Plant.vi					
	X			X			LinearPIntInvFF_New.vi					
	X	X	+	X		$\longrightarrow$	LinearPIntInvFF_Reset_Initial.vi LinearPIntInvFF Reset Zero.vi					
		+^	+-				Linear Finding Francisco					
				1 '	. 1							
	mented	mented	- NPILIB	Item	ution Optimized	Routine	ele Program			Review	Program	•
	nplemented	ocumented	ot WPILIB	enu Item	xecution Optimized	est Routine	ample Program			ode Review	est Program	•
LINEAR OLIADRATIC REGULATO	<b>a</b> ≺ Implemented	∠ Documented	Not WPILIB	Menu	Execution Optimized	Test Routine	S VI Name	Function Prototype	Notes	Code Review	Test Program	
LINEAR QUADRATIC REGULATO	R X	X		X	Execution Optimized	Test Routine	VI Name  LinearQuadraticRegulator Calculate NextR.vi	Function Prototype	Notes	Code Review		
LINEAR QUADRATIC REGULATO	R X X	X X X		X	Execution		VI Name  LinearQuadraticRegulator_Calculate_NextR.vi  LinearQuadraticRegulator_Calculate.vi  LinearQuadraticRegulator_GetK Single.vi	Function Prototype	Notes  NOT ORIGINAL	Code Review		
LINEAR QUADRATIC REGULATO	X X X X	X X X X		X X X	Execution	X Test Routine	VI Name  LinearQuadraticRegulator_Calculate_NextR.vi  LinearQuadraticRegulator_Calculate.vi  LinearQuadraticRegulator_GetK_Single.vi  LinearQuadraticRegulator_GetK.vi	Function Prototype		Code Review		
LINEAR QUADRATIC REGULATO	X   X   X   X   X   X   X   X   X   X	X X X X		X X X	Execution		VI Name  LinearQuadraticRegulator_Calculate_NextR.vi  LinearQuadraticRegulator_Calculate.vi  LinearQuadraticRegulator_GetK_Single.vi  LinearQuadraticRegulator_GetK.vi  LinearQuadraticRegulator GetR Single.vi	Function Prototype		Code Review		
LINEAR QUADRATIC REGULATO	R	X X X X X X		X X X	Execution		VI Name  LinearQuadraticRegulator_Calculate_NextR.vi  LinearQuadraticRegulator_Calculate.vi  LinearQuadraticRegulator_GetK_Single.vi  LinearQuadraticRegulator_GetK.vi  LinearQuadraticRegulator_GetR_Single.vi  LinearQuadraticRegulator_GetR_Single.vi  LinearQuadraticRegulator_GetR.vi  LinearQuadraticRegulator_GetU_Single.vi	Function Prototype		Code Review		
LINEAR QUADRATIC REGULATO	R	X X X X X X X		X X X X X	Execution	X	VI Name  LinearQuadraticRegulator_Calculate_NextR.vi LinearQuadraticRegulator_Calculate.vi LinearQuadraticRegulator_GetK_Single.vi LinearQuadraticRegulator_GetK.vi LinearQuadraticRegulator_GetR_Single.vi LinearQuadraticRegulator_GetR.vi LinearQuadraticRegulator_GetU_Single.vi LinearQuadraticRegulator_GetU_Single.vi LinearQuadraticRegulator_GetU_Single.vi	Function Prototype	NOT ORIGINAL	Code Review		
LINEAR QUADRATIC REGULATO	X	X X X X X X X		X X X X X X	Execution		VI Name  LinearQuadraticRegulator_Calculate_NextR.vi LinearQuadraticRegulator_Calculate.vi LinearQuadraticRegulator_GetK_Single.vi LinearQuadraticRegulator_GetK.vi LinearQuadraticRegulator_GetR_Single.vi LinearQuadraticRegulator_GetR.vi LinearQuadraticRegulator_GetU_Single.vi LinearQuadraticRegulator_GetU_Single.vi LinearQuadraticRegulator_GetU.vi LinearQuadraticRegulator_LatencyCompensate.vi	Function Prototype		Code Review		
LINEAR QUADRATIC REGULATO	R	X X X X X X X X X		X X X X X	Execution	X	VI Name  LinearQuadraticRegulator_Calculate_NextR.vi LinearQuadraticRegulator_Calculate.vi LinearQuadraticRegulator_GetK_Single.vi LinearQuadraticRegulator_GetK.vi LinearQuadraticRegulator_GetR_Single.vi LinearQuadraticRegulator_GetR.vi LinearQuadraticRegulator_GetU_Single.vi LinearQuadraticRegulator_GetU_Single.vi LinearQuadraticRegulator_GetU_Single.vi	Function Prototype	NOT ORIGINAL  Routine exists, but it only has	Code Review		

oder follower and time	e miler p	บเลเลม	e routii	ies.									
	X	X		X		Χ		LinearQuadraticRegulator_New_SystemELMS.vi					
	X	X		Χ				LinearQuadraticRegulator_New.vi					
	X	X		Χ				LinearQuadraticRegulator_Reset.vi					
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name F	Function Prototype	Notes	Code Review	Test Program	Error Checking
LINEAR SYSTEM	X	Χ		Χ	1			LinearSystem_CalculateX.vi					
	X	X		Χ	- 1			LinearSystem_CalculateY.vi					
	X	X		Χ	SI			LinearSystem_GetA.vi					
	X	X		Χ	SI			LinearSystem_GetAElement.vi					
	X	X		Χ	SI			LinearSystem_GetB.vi					
	X	X		Χ	SI			LinearSystem_GetBElement.vi					
	X	X		X	SI			LinearSystem_GetC.vi					
	X	X		X	SI			LinearSystem_GetCElement.vi					
	X	X		X	SI			LinearSystem_GetD.vi					
	Χ	Χ		Χ	SI			LinearSystem_GetDElement.vi					
	Χ	Χ		Χ	SI			LinearSystem_New.vi					

	Implemented	Documented	мепи пет	Execution Optimized	Test Routine	Egy VI Name Function Prototype	Notes	Code Review	Test Program	Error Checking
LINEAR SYSTEM LOOP		Χ	X			LinearSystemLoop_ClampInput.vi				
	Χ	Χ	 X			LinearSystemLoop_Correct.vi				
						LinearSystemLoop_GetClampFunction.vi				
	X	X	 X			LinearSystemLoop_GetController.vi				
	X	X	 X X			LinearSystemLoop_GetError_Single.vi				
•	X		X X			LinearSystemLoop_GetError.vi				
•	X	X	X X			LinearSystemLoop_GetFeedForward.vi				
•	X	X	X			LinearSystemLoop_GetNextR_Single.vi LinearSystemLoop_GetNextR.vi				
	$\hat{x}$	$\stackrel{\wedge}{X}$	X			LinearSystemLoop_GetNextr.vi				
	$\hat{x}$	X	X			LinearSystemLoop_GetU_Row.vi				
	X	X	X			LinearSystemLoop_GetU.vi				
	X	X	X			LinearSystemLoop_GetXHat_Single.vi				
	X	X	×			LinearSystemLoop_GetXHat.vi				
						LinearSystemLoop New BBB				
						LinearSystemLoop_New_LinearSystem_ClampFunc				
	Χ	Х	X			LinearSystemLoop_New_LinearSystem_ClampVal.vi				
	Χ	Χ	X			LinearSystemLoop_New.vi				
	Χ	Χ	X			LinearSystemLoop_Predict.vi				
	Χ	Χ	X			LinearSystemLoop_Reset.vi				
						LinearSystemLoop_SetClampFunction.vi				
						LinearSystemLoop_SetNextR_Some.vi				
	Χ	Χ	X			LinearSystemLoop_SetNextR.vi				
						LinearSystemLoop_SetXHat_Single.vi				
						LinearSystemLoop_SetXHat.vi				

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Revision 2.X 5/2/2022 – added implicit model follower and time	e interpo	olatable	e routine	϶s. Φ							
LTV DIFFERENTIAL DRIVE CONTROLLER	X X X Implemented	Documented	) ) )	X X X Menu Item  Execution Optimize	Test Routine	VI Name  LTVDiffDriveCtrl_Calculate.vi  LTVDiffDriveCtrl_New.vi  LTVDiffDriveCtrl_Calculate_TrajState.vi  LTVDiffDriveCtrl_Calculate_SetTolerance.vi  LTVDiffDriveCtrl_Calculate_AtReference.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	Implemented	Documented	Not W	Menu Item Execution Optimized	Test Routine		Function Prototype	Notes	Code Review	Test Program	Error Checking
LTV UNICYCLE CONTROLLER	X			X X	X			This one computes a new LQR			
	X		X		X			each time. This one computes a new LQR each time.			
	X			X	X			each ume.			
	X			X X	X						
	X		>	Χ	Х	LTVUnicycleCtrl_SetEnabled.vi					
	Χ		>	X	X	LTVUnicycleCtrl_SetTolerance.vi					_
'======= STATE SPACE UTILITIES '=========											
CALLBACK HELPER	X X X	X X X Documented	X	X X X	Test Routine	VI Name  CallbackHelp_MatrixMinus.vi  CallbackHelp_MatrixMult_CoerceSizeB.vi  CallbackHelp_MatrixMult.vi  CallbackHelp_MatrixPlus.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
DISCRETIZATION	X X X	X X X	) )	X X X Menu Item Execution Optimized	X X X Test Routine	VI Name  Discretization_DiscretizeA.vi  Discretization_DiscretizeAB.vi  Discretization_DiscretizeABTaylor.vi  Discretization_DiscretizeAQ.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
				X	X						
	X	X		X	+	Discretization_DiscretizeR.vi					

STATE SPACE UTIL	X Implemented	X Documented	X Not WPILIB	od Menu Item	Execution Optimized	Test Routine	E B B B B B B B B B B B B B B B B B B B	Function Prototype	Notes Internal routine	Code Review	Test Program	Error Checking
	X	Χ		Χ			StateSpaceUtil_ClampInputMaxMagnitude.vi		Routine exists, it is just a shell			
	Χ	Χ		Χ			StateSpaceUtil_IsDetectable.vi					
	X	X		Χ			StateSpaceUtil_IsStabalizable.vi					
	Χ	Χ		X		Χ	StateSpaceUtil_MakeCostMatrix.vi					
	X	Χ		X		Χ	StateSpaceUtil_MakeCovarianceMatrix.vi					
	X	X		X			StateSpaceUtil_MakeWhiteNoiseVector.vi					
	Χ	Χ		X			StateSpaceUtil_NomalizeInputVector.vi					
	X	X		Χ			StateSpaceUtil_PoseTo3dVector.vi					
	Χ	X		Χ			StateSpaceUtil_PoseTo4dVector.vi					
	X	X		Χ			StateSpaceUtil_PoseToVector.vi					
										'		

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

BATTERY SIM	X X Implemented	X X Documented	Not WPILIB	X Menu Item	ত ত Execution Optimized	Test Routine	VI Name BatterySim_CalculateDefaultBatteryLoadedVoltage.vi BatterySim_CalculateLoadedVoltage.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
DC MOTOR SIM	X X Implemented	X X Documented	Not WPILIB	X X Menu Item	Execution Optimized	Test Routine	VI Name  DCMotorSim_getAngularPositionRad.vi  DCMotorSim_getAngularPositionRotations.vi  DCMotorSim_getAngularVelocityRadPerSec.vi  DCMotorSim_getAngularVelocityRPM.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	X X X X	X X X X		X X X X X			DCMotorSim_getAngularVelocityRPM.vi DCMotorSim_GetCurrentDrawAmps.vi DCMotorSim_New_MOl.vi DCMotorSim_New_Plant.vi DCMotorSim_SetInputVoltage.vi DCMotorSim_Update.vi					
DIFFERENTIAL DRIVE TRAIN SIM	X X Implemented	X X Documented	Not WPILIB	X Wenu Item	Execution Optimized	Test Routine	VI Name DiffDriveTrainSim_ClampInput.vi DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking

	X		X				ElevatorSim GetPositionMeters.vi  ElevatorSim GetVelocityMetersPerSecond.vi  ElevatorSim HasHitLowerLimit.vi  ElevatorSim HasHitUpperLimit.vi  ElevatorSim New LinSys NoNoise.vi  ElevatorSim New LinSys.vi  ElevatorSim New NoNoise.vi  ElevatorSim New.vi  ElevatorSim New.vi  ElevatorSim RKF45 Func.vi  ElevatorSim SetInputVoltage.vi  ElevatorSim SetState.vi  ElevatorSim Update.vi  ElevatorSim UpdateX.vi  ElevatorSim WouldHitLowerLimit.vi  ElevatorSim WouldHitUpperLimit.vi		Needed because this doesn't extend.			
	X		X				ElevatorSim GetPositionMeters.vi  ElevatorSim GetVelocityMetersPerSecond.vi  ElevatorSim HasHitLowerLimit.vi  ElevatorSim HasHitUpperLimit.vi  ElevatorSim New LinSys_NoNoise.vi  ElevatorSim New NoNoise.vi  ElevatorSim New NoNoise.vi  ElevatorSim New.vi  ElevatorSim RKF45_Func.vi  ElevatorSim SetInputVoltage.vi  ElevatorSim SetState.vi  ElevatorSim_Update.vi  ElevatorSim_UpdateX.vi  ElevatorSim_WouldHitLowerLimit.vi					
	X		X X X X No X X X				ElevatorSim GetPositionMeters.vi  ElevatorSim GetVelocityMetersPerSecond.vi  ElevatorSim HasHitLowerLimit.vi  ElevatorSim New LinSys_NoNoise.vi  ElevatorSim New LinSys.vi  ElevatorSim New NoNoise.vi  ElevatorSim New NoNoise.vi  ElevatorSim New.vi  ElevatorSim RKF45_Func.vi  ElevatorSim SetInputVoltage.vi  ElevatorSim SetState.vi  ElevatorSim_Update.vi					
	X		X X X X No X X X				ElevatorSim GetPositionMeters.vi  ElevatorSim GetVelocityMetersPerSecond.vi  ElevatorSim HasHitLowerLimit.vi  ElevatorSim New LinSys_NoNoise.vi  ElevatorSim New LinSys.vi  ElevatorSim New NoNoise.vi  ElevatorSim New NoNoise.vi  ElevatorSim New.vi  ElevatorSim RKF45_Func.vi  ElevatorSim SetInputVoltage.vi  ElevatorSim SetState.vi  ElevatorSim_Update.vi					
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	X X X X X X X X X X X X X X X X X X X		X X X X No				ElevatorSim_GetPositionMeters.vi  ElevatorSim_GetVelocityMetersPerSecond.vi  ElevatorSim_HasHitLowerLimit.vi  ElevatorSim_HasHitUpperLimit.vi  ElevatorSim_New_LinSys_NoNoise.vi  ElevatorSim_New_LinSys.vi  ElevatorSim_New_NoNoise.vi  ElevatorSim_New_NoNoise.vi  ElevatorSim_New.vi  ElevatorSim_RKF45_Func.vi  ElevatorSim_SetInputVoltage.vi					
	X		X X X X No				ElevatorSim_GetPositionMeters.vi  ElevatorSim_GetVelocityMetersPerSecond.vi  ElevatorSim_HasHitLowerLimit.vi  ElevatorSim_HasHitUpperLimit.vi  ElevatorSim_New_LinSys_NoNoise.vi  ElevatorSim_New_LinSys.vi  ElevatorSim_New_NoNoise.vi  ElevatorSim_New_NoNoise.vi  ElevatorSim_New.vi  ElevatorSim_New.vi					
	X X X X X	(	X X X				ElevatorSim_GetPositionMeters.vi  ElevatorSim_GetVelocityMetersPerSecond.vi  ElevatorSim_HasHitLowerLimit.vi  ElevatorSim_HasHitUpperLimit.vi  ElevatorSim_New_LinSys_NoNoise.vi  ElevatorSim_New_LinSys.vi  ElevatorSim_New_NoNoise.vi  ElevatorSim_New_NoNoise.vi					
	X X X X X	(	X X X				ElevatorSim GetPositionMeters.vi  ElevatorSim GetVelocityMetersPerSecond.vi  ElevatorSim HasHitLowerLimit.vi  ElevatorSim HasHitUpperLimit.vi  ElevatorSim New LinSys NoNoise.vi  ElevatorSim New LinSys.vi  ElevatorSim New NoNoise.vi					
	X X	(	X				ElevatorSim_GetPositionMeters.vi ElevatorSim_GetVelocityMetersPerSecond.vi ElevatorSim_HasHitLowerLimit.vi ElevatorSim_HasHitUpperLimit.vi ElevatorSim_New_LinSys_NoNoise.vi ElevatorSim_New_LinSys.vi					
	X X	(	X				ElevatorSim_GetPositionMeters.vi ElevatorSim_GetVelocityMetersPerSecond.vi ElevatorSim_HasHitLowerLimit.vi ElevatorSim_HasHitUpperLimit.vi ElevatorSim_New_LinSys_NoNoise.vi					
	X X	(	X				ElevatorSim_GetPositionMeters.vi ElevatorSim_GetVelocityMetersPerSecond.vi ElevatorSim_HasHitLowerLimit.vi					
	X	(	X				ElevatorSim_GetPositionMeters.vi ElevatorSim_GetVelocityMetersPerSecond.vi					
			X				ElevatorSim_GetPositionMeters.vi					
ELEVATOR SIM			X				ElevatorSim GetCurrentDraw.vi		İ			
			<u>×</u>	Щ	7e	Sa		Function Prototype	Notes		7e	Ē
	Implemented	Not WPILIB	Menu Item	Execution	Test Routine	Sample				Code Revie	sst F	Error
	пеп	12	Iten	rtion	Rout	le P				Rev	rog	Che
	ted	9	,	ď	ine	Program				iew	ram	Checking
				timi;		am						B
				pəz								
	X	(	X				DiffDriveTrainSim_Update.vi					
	X X		X				DiffDriveTrainSim_ToughBoxMiniMotor.vi					
	X	(	X				DiffDriveTrainSim_ToughBoxMiniGearRatio.vi					
	X		X				DiffDriveTrainSim_SetState.vi					
	X X		X				DiffDriveTrainSim_SetInputs.vi					
	XXX		X				DiffDriveTrainSim_SetCurrentGearing.vi DiffDriveTrainSim SetInputs.vi					
	X		X				DiffDriveTrainSim_New.vi					
	X	(	X				DiffDriveTrainSim_New_Mass_MOI.vi					
	X		X				DiffDriveTrainSim KitBotWheelSize.vi					
	X		X				DiffDriveTrainSim GetState_vi					
	XXX		X				DiffDriveTrainSim_GetState_Single.vi					
	XXX		X				DiffDriveTrainSim_GetRightPositionMeters.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi					
	X X		X				DiffDriveTrainSim_GetRightCurrentDrawAmps.vi					
	X	(	X				DiffDriveTrainSim_GetPose.vi					
	X		X				DiffDriveTrainSim_GetOutput_Single.vi					
	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$		X				DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi					
	X X		X				DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftPositionMeters.vi					
	XX		X				DiffDriveTrainSim_GetHeading.vi					
	X X		X				DiffDriveTrainSim_GetDynamics.vi					
	X		Χ				DiffDriveTrainSim_GetCurrentGearing.vi					
	X		X				DiffDriveTrainSim_GetCurrentDrawAmps.vi					
		(	X				DiffDriveTrainSim CreateKitbotSim.vi					

FRC LabVIEW Trajectory Library – VI Implementation	l ist											
Revision 2.X 5/2/2022 – added implicit model follower and time		polatal	ble routi	ines.				_				
·							FlyWheelSim_New_LinSys_NoNoise		Future			
	X	X		X			FlyWheelSim_New_MOI.vi					<u> </u>
	X			X X			FlyWheelSim_SetInput.vi FlyWheelSim_SetState.vi					
	X			X			FlyWheelSim_Update.vi			+		
LINEAR SYSTEM SIM	X	X		X X X	Execution Optimized	Sample Program	VI Name LinearSystemSim_ClampInput.vi LinearSystemSim_GetCurrentDrawAmps.vi LinearSystemSim_GetOutput_Single.vi LinearSystemSim_GetOutput.vi	Function Prototype	Notes  DONT IMPLEMENT	Code Review	Test Program	Error Checking
	Χ	Χ		Χ			LinearSystemSim_New LinearSystemSim_New_NoNoise.vi					
	X	Х		Х			LinearSystemSim_SetInput_Array.vi		Doesn't use clamp ?	+		<u> </u>
	Χ	Χ		X			LinearSystemSim_SetInput_Single.vi		·			
	Χ			Χ			LinearSystemSim_SetInput.vi					
	X			X			LinearSystemSim_Setstate.vi					į
	X			X No			LinearSystemSim_Update.vi LinearSystemSim_UpdateX.vi					<u> </u>
	X	X		No			LinearSystemSim_UpdateY.vi					
SINGLE JOINT ARM 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 X X	Execution Optimized	Sample Program	VI Name  SngJntArmSim_EsitmateMOI.vi  SngJntArmSim_GetAngleRads.vi  SngJntArmSim_GetCurrentDraw.vi  SngJntArmSim_GetVelocityRadsPerSec.vi  SngJntArmSim_HasHitLowerLimit.vi  SngJntArmSim_HasHitUpperLimit.vi  SngJntArmSim_New.vi  SngJntArmSim_Rkf45_Func.vi  SngJntArmSim_SetInputVoltage.vi  SngJntArmSim_SetState.vi  SngJntArmSim_Update.vi  SngJntArmSim_UpdateX.vi  SngJntArmSim_WouldHitLowerLimit.vi  SngJntArmSim_WouldHitLowerLimit.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATRIX UTILITIES '========												
MAT BUILDER	× Implemented	× Documented	Not WPILIB		© Execution Optimized	Sample Program	VI Name MatBuilder Create.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	^_	_ ^	1	^	JI		watbulluci_Oreate.vi					
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		X	10 100	X	SI		MatBuilder_Fill.vi					
							· <u> </u>					
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATRIX	Χ	Χ		X	SI		Matrix_AssignBlock.vi					
	Χ	Χ		Χ	SI		Matrix_Block.vi					
_	V	V		Χ	SI		Matrix_ChangeBoundsUnchecked.vi Matrix_Create.vi					
	X	X		_ X	31		Matrix Det.vi					
	X	X		X	SI		Matrix_Diag.vi					
				- , .			Matrix Div Scalar.vi		labview has function			
							Matrix ElementPower.vi					
	Χ	Χ		Χ	SI		Matrix_ElementSum.vi					
							Matrix_ElementTimes.vi					
					,		Matrix_Equals.vi					
	X	X		X	SI		Matrix_Exp.vi Matrix ExtractColumnVector.vi					
-		$\hat{X}$		X	SI		Matrix ExtractFrom.vi					
					, O,		Matrix ExtractMatrix.vi					
	X	X		X	SI		Matrix_ExtractRowVector.vi					
		Χ		Χ	SI		Matrix_Fill.vi					
							Matrix_Get.vi		labview has function			
	Χ	Χ		Χ	1		Matrix_Ident.vi		WPILIB calls this EYE			
_	X	V		V	SI		Matrix_Inv.vi					
	^	^		_ X	31		Matrix_IsEqual.vi Matrix_IsIdentical.vi					
	X	X		X	,		Matrix_LLTDecompose.vi					
							Matrix Max.vi					
							Matrix_MaxAbs.vi					
							Matrix_Mean.vi					
							Matrix_MinInternal.vi					
_							Matrix_Minus_Matrix.vi					
_	X	X		X	1		Matrix_Minus_Scalar.vi Matrix_NormF.vi					
-	^	^		^			Matrix NormIndP1.vi					
							Matrix_Plus_Matrix.vi					
							Matrix_Plus_Scalar.vi					
	Χ	Χ		Χ	1		Matrix_Pow.vi		THIS NEEDS WORK!!!!			
	Χ	Χ		Χ	SI		Matrix_SetColumn.vi					
	X	X		X	SI		Matrix_SetRow.vi	THERE ARE LOTS OF OTHER MATRIX FUNCTIONS THAT SHOULD BE INCLUDED HERE FOR ISOLATION.				
							Matrix Solve.vi	SHOOLD BE INCLUDED HEIZE FOR ISOLATION.				
							Matrix_Times_Matrix.vi					
							Matrix_Times_Scalar.vi					
							Matrix_Trace.vi					
_		Χ	X	X	SI		Matrix_Transpose.vi Matrix_WithinTolerance.vi					
-	Χ			^			iviatrix_vvitriiir i olerance.vi					
	mplemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	VI Name			Code Review	t Program	Error Checking
	du,	200	Vot	Ver	ii) Ye	Tes	VI Name	Function Prototype	Notes	80	Tes	Ξrrc
SIMPLE MATRIX	X	X		X	SI		SimpleMatrix_ExtractMatrix.vi		NOTE Matrix also has an ExtractMatrix with different calling parameters YUK.		17	<i>F</i>

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

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

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
ANGLE STATISTICS	X	X	X	Χ	X		AngleStats_AngleAdd_CallbackHelp.vi					
	Χ	X		X	1	X	AngleStats_AngleAdd.vi					
	X	X	X	X	X		AngleStats_AngleMean_CallbackHelp.vi					
	Χ	X		X	1	X						
	Χ	X	X	X	X		AngleStats_AngleResidual_CallbackHelp.vi					
	X	X		X	1	X						

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program emple Program	Function Prototype Notes	Code Review	Test Program	Error Checking
MATH UTILITY	X	Χ		Χ	SI		MathUtil_AngleModulus.vi				
	Χ	X		X	SI		MathUtil_ApplyDeadband.vi				
	X	Χ		Χ	SI		MathUtil Clamp Int.vi				

added implicit model follower and time	interp	olata	ble rou	tines.								
	Χ	X		X	SI			MathUtil_Clamp.vi				
	Χ	X		Χ	SI			MathUtil_InputModulus.vi				
	Χ	X		Χ	Si			MathUtil_Interpolate.vi				
MERWE SCALED SIGMA POINTS		X Documented	Not WPILIB	X Menu Item	- Execution Optimized	Test Routine	Sample Program	VI Name Function Prototype  MerweScSigPts_ComputeWeights.vi	Notes	Code Review	Test Program	Error Checking
	X	X		Χ	SI			MerweScSigPts_GetNumSigmas.vi				
	Χ	X		X	SI			MerweScSigPts_GetWc_Single.vi				
	Χ	X		Χ	SI			MerweScSigPts_GetWc.vi				
	Χ	Χ		Χ	SI			MerweScSigPts_GetWm_Single.vi				
	Χ	X		Χ	SI			MerweScSigPts_GetWm.vi				
	Χ	X		X	1			MerweScSigPts_New_Default.vi				
	Χ	Χ		Χ	1			MerweScSigPts_New.vi				
	Χ	Χ		Χ	1			MerweScSigPts_SigmaPoints.vi				
	mplemented	Documented	Not WPILIB	Menu Item	Execution Optimize	Test Routine	Sample Program	VI Name Function Prototype	Notes	Code Review	Test Program	Error Checking
NUMERICAL INTEGRATION	X	X		_ <u>&lt;</u>	<u> </u>	_		NumIntegrate_Func_Ax_Bu_K.vi	NOT USED. Should this be used			
NOMERICAL INTEGRATION	_ ^	^		^	'			ivuililitegrate_i ulic_AA_bu_it.vi	or abandoned???			
	X	X		Χ				NumIntegrate_Rk4_Dbl_X_U.vi	or abandonod : :			
	X	X		X				NumIntegrate_Rk4_Dbl_X.vi				
	X	X		X				NumIntegrate_Rk4_Mat_X_U.vi				
	X	X		X		<del>                                     </del>		NumIntegrate_Rk4_Mat_X.vi				
	X	X		No	SI	1		NumIntegrate_Rkdp_Func_A.vi				
	X	X		No	SI			NumIntegrate_Rkdp_Func_B1.vi				
	X	X		No	SI			NumIntegrate_Rkdp_Func_B1B2.vi				
	X	X		No	SI			NumIntegrate_Rkdp_Func_B2.vi				
	X	X		No	1			Numintegrate_Rkdp_Impl.vi				
	X	X		Χ				NumIntegrate_RKDP_Mat_X_U.vi	New replacement for RKF45			
	X	Χ		No	SI			NumIntegrate_Rkf45_Func_A.vi	·			
	X	X		No	SI			NumIntegrate_Rkf45_Func_B1.vi				
	Χ	Χ		No	SI			NumIntegrate_Rkf45_Func_B1B2.vi				
	X	X		No	SI	Т —		NumIntegrate_Rkf45_Func_B2.vi				
	_ ^				J 01							
					J.			NumIntegrate_RKf45_Func_Bs.vi	Removed. Replaced with newer functions.			
					31			NumIntegrate_RKf45_Func_Bs.vi NumIntegrate_RKf45_Func_Ch.vi	functions.  Removed. Replaced with newer functions.			
								NumIntegrate_RKf45_Func_Bs.vi  NumIntegrate_RKf45_Func_Ch.vi  NumIntegrate_RKf45_Func_Ct.vi	functions.  Removed. Replaced with newer			
	X	X		No				NumIntegrate_RKf45_Func_Bs.vi  NumIntegrate_RKf45_Func_Ch.vi  NumIntegrate_RKf45_Func_Ct.vi  NumIntegrate_Rkf45_Impl.vi	functions.  Removed. Replaced with newer functions.  Removed. Replaced with newer functions.			
								NumIntegrate_RKf45_Func_Bs.vi  NumIntegrate_RKf45_Func_Ch.vi  NumIntegrate_RKf45_Func_Ct.vi  NumIntegrate_Rkf45_Impl.vi  NumIntegrate_Rkf45_Mat_X_U.vi	functions.  Removed. Replaced with newer functions.  Removed. Replaced with newer functions.  Note that this Feinberg method has been changed and a Dormand Price method has been implemented TODO			
	X	X X	X	No X	I			NumIntegrate_RKf45_Func_Bs.vi  NumIntegrate_RKf45_Func_Ch.vi  NumIntegrate_RKf45_Func_Ct.vi  NumIntegrate_Rkf45_Impl.vi  NumIntegrate_Rkf45_Mat_X_U.vi  NumIntegrate_RKf45_New.vi	functions.  Removed. Replaced with newer functions.  Removed. Replaced with newer functions.  Note that this Feinberg method has been changed and a Dormand Price method has been			
	X	X X	X	No X	I			NumIntegrate_RKf45_Func_Bs.vi  NumIntegrate_RKf45_Func_Ch.vi  NumIntegrate_RKf45_Func_Ct.vi  NumIntegrate_Rkf45_Impl.vi  NumIntegrate_Rkf45_Mat_X_U.vi	functions.  Removed. Replaced with newer functions.  Removed. Replaced with newer functions.  Note that this Feinberg method has been changed and a Dormand Price method has been implemented TODO			

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VISION
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Riccati Input Check.vi

| Particular Protection Prototype | Notes | Particular Prototype | Notes | Particular Prototype | Notes | Particular Prototype | Particular Prototype | Notes | Particular Prototype |

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

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Z	r and time	and time interpolatable routines.									
Type						İΖΘ		_			
TypeDef   Z						Ĭ.		ш			
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T	_		Ğ		Ž	ш	76	Š	VI Name	Function Prototype	Notes
T	TypeDef	Ζ	X	X	X	N/A			ARM FF.CTL		
				X		N/A			BANG BANG.CTL		
ONLINENCE FURC. TYPE CTL.   Colorate   Col		1									NOT USED. Should this be
Z		١,		^	^	14/7			DIOON-WANK_1 ONO_111 E.OTE		
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2		Z	X	X	X	N/A			COORDINATE_SYSTEM.CTL		
2		Ζ	X	X	Χ	N/A			DCMOTOR TYPES ENUM.CTL		
2				X					DCMOTOR.CTL		
Z											
2	-										
Z	-										
Z	-										
Z											
Z											
Z		Ζ	_ X	Χ	X				DIFF_DRIVE_Kitbot_WheelSize_ENUM.ctl		
Z											
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Z	-										
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Z	-										
Z											
UTIL_WEIGHTED_WAYPOINIT.			X	X	Χ	NA					
Z		Z	X	X	Χ	NA			DISPLAY_WEIGHTED_WAYPOINT.ctl		New V1.5. was
Z											UTIL_WEIGHTED_WAYPOINIT.VI
Z											
Z		Ζ	X	X	Х	N/A			ELEV FF.CTL		
Z	-										
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Z	-		^								
Z	_										
Z											
Z		Z	X	X	X	N/A			FUNCTION_GENERATOR.ctl		
Z		Ζ	X	Χ	X	N/A			FUNCTION GENERATOR MATRIX.ctl		
Z											New 1/26/21
Z											11011 1/20/21
Z	-				$\hat{}$						
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Z											
Z         X         X         N/A         KALMAN FILTER.Ctl            Z         X         X         X         N/A         LINEAR FILTER.CTL            Z         X         X         N/A         LINEAR FLANT INV.FF.ctl            Z         X         X         N/A         LINEAR QUADRATIC REGULATOR.ctl            Z         X         X         N/A         LINEAR SYSTEM_LOOP.ctl            Z         X         X         N/A         LINEAR SYSTEM_SIM.ctl            Z         X         X         N/A         LINEAR SYSTEM_LOOP.ctl            Z         X         X         N/A         LINEAR SYSTEM_LOOP.ctl            Z         X         X         N/A         LIVEAR.CTL.STANCE            Z         X         X         N/A         LIVEAR.CTL.STANCE </th <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>KALMAN_FILTER_LATENCY_COMP_FUNC_GROUP.CTL</th> <th></th> <th></th>									KALMAN_FILTER_LATENCY_COMP_FUNC_GROUP.CTL		
Z         X         X         N/A         KALMAN_FILTER.Ctt		Z	X	X	X	N/A			KALMAN_FILTER_LATENCY_COMP.CTL		
Z											
Z									_		
Z         X         X         N/A         LINEAR_QUADRATIC_REGULATOR.ctl           Z         X         X         N/A         LINEAR_SYSTEM_LOOP.ctl           Z         X         X         N/A         LINEAR_SYSTEM_SIM.ctl           Z         X         X         N/A         LINEAR_SYSTEM.ctl           Z         X         X         N/A         LINEAR_SYSTEM.ctl           Z         X         X         N/A         LIV_DIFF_DRIVE_CTRL.ctl           Z         X         X         N/A         LIV_DIFF_DRIVE_CTRL.ctl           Z         X         X         N/A         LIV_UNICYCLE_CONTROLLER.CTL           Z         X         X         N/A         LIV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl           Z         X         X         N/A         LIV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl           Z         X         X         N/A         MECA_DRIVE_MINICIS.CTL           Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_DOSE_EST.CTL           Z         X         X         X         N/A         MECA_DRIVE_SPEDS.CTL           Z         X         X	-										+
Z         X         X         N/A         LINEAR SYSTEM_LOOP.ctl           Z         X         X         N/A         LINEAR SYSTEM_SIM.ctl           Z         X         X         N/A         LINEAR SYSTEM_Ctl           Z         X         X         N/A         LINEAR SYSTEM_Ctl           Z         X         X         N/A         LINEAR SYSTEM_LOOP.ctl           Z         X         X         N/A         LINEAR SYSTEM_LOOP.ctl           LINEAR SYSTEM_LOOP.ctl         LINEAR SYSTEM_LOOP.ctl         LINEAR SYSTEM_LOOP.ctl           Z         X         X         N/A         LINEAR SYSTEM_LOOP.ctl           Z         X         X         N/A         LINEAR SYSTEM_LOOP.ctl         LINEAR SYSTEM_LOOP.ctl           Z         X         X         N/A         LINEAR SYSTEM_LOOP.ctl         LINEAR SYSTEM_LOOP.ctl           Z         X         X         N/A         LIV_UNICYCLE_CTRLETCL         LINEAR SYSTEM_LOOP.ctl           Z         X         X         N/A         MECA_DRIVE_CONTROLLER_INDUCT         LINEAR SYSTEM_LOOP.ctl           Z         X         X         N/A         MECA_DRIVE_CONTROLLER_INDUCT         LINEAR SYSTEM_LOOP.ctl           Z         X         X<	-										
Z         X         X         N/A         LINEAR_SYSTEM_SIM.ctl           Z         X         X         N/A         LINEAR_SYSTEM_ctl           Z         X         X         N/A         LTV_DIFF_DRIVE_CTRL_ctl           Z         X         X         N/A         LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl           Z         X         X         N/A         MECA_DRIVE_KINEMATICS.CTL           Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_POSE_EST.CTL           Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL	-										
Z         X         X         N/A         LINEAR_SYSTEM.ctl           Z         X         X         N/A         LTV_DIFF_DRIVE_CTRL.ctl           Z         X         X         N/A         LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_CTL           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl           Z         X         X         N/A         MECA_DRIVE_CONTROLLER_STATE_ENUM.ctl           Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_POSE_EST.CTL           Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL											
Z         X         X         N/A         LTV_DIFF_DRIVE_CTRL.ctl           Z         X         X         N/A         LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER.CTL           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl           Z         X         X         N/A         MECA_DRIVE_KINEMATICS.CTL           Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_POSE_EST.CTL           Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL		Ζ	X	X	Χ	N/A					
Z         X         X         N/A         LTV_DIFF_DRIVE_CTRL.ctl           Z         X         X         N/A         LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER.CTL           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl           Z         X         X         N/A         MECA_DRIVE_KINEMATICS.CTL           Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_POSE_EST.CTL           Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL		Ζ	X	X	X	N/A			LINEAR SYSTEM.ctl		
Z         X         X         N/A         LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl											
Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl           Z         X         X         N/A         MECA_DRIVE_KINEMATICS.CTL           Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_POSE_EST.CTL           Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL											
Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl	-										
Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl           Z         X         X         X         N/A         MECA_DRIVE_KINEMATICS.CTL           Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_POSE_EST.CTL           Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL	-										
Z         X         X         N/A         MECA_DRIVE_KINEMATICS.CTL           Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_POSE_EST.CTL           Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL											
Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_POSE_EST.CTL           Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL											
Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_POSE_EST.CTL           Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL		Z									
Z         X         X         N/A         MECA_DRIVE_POSE_EST.CTL           Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL	Ī	Ζ	X	Χ		N/A			MECA_DRIVE_ODOMETRY.CTL		
Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL											
Z X X X N/A MEDIAN_FILTER.CTL			X								
L A A A A IN/A   INIEKWE_SCALED_SIGNIA_P1S.CII	-										
	L		٨	Λ	Λ	IV/A			INIEUNE OOALED OIGINIA LI 19'CII		

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<u>e interp</u>	interpolatable routines.								
Z	X	X	X	N/A	OBSERVER_SNAP_LIST_ITEM.CTL				
Z	Χ	X	Χ	N/A	OBSERVER_SNAPSHOT.CTL				
Z	Χ	Χ	Χ	N/A	PARAM STACK ITEM.CTL				
Z	Х	Χ	X	N/A	PARAM STACK.CTL				
Z	X	X	X	N/A	PID ADV LIMITS.CTL				
Z	X	X	X	N/A	PID ADV TUNING.CTL				
Z	X	X	X	N/A	PID CONTROLLER.CTL				
	$\hat{X}$	X	X	N/A	PID ERROR TOLERANCE.CTL				
Z									
Z	X	X	X	N/A	PID_INPUT_LIMITS.CTL				
Z	X	X	X	N/A	PID_TUNING.CTL				
Z	X	Χ	X	N/A	POSE2D.CTL				
Z	X	Χ	Χ	N/A	POSE3D.CTL				
Z	Χ	Χ	Χ	N/A	POSEwCURVATURE.CTL				
Z	Χ	Χ	Χ	N/A	PROFILED_PID_CONTROLLER.CTL				
Z	Χ	Χ	Χ	N/A	QUATERNION.CTL QUATERNION.CTL				
Z	Χ	Χ	Χ	N/A	RAMSETE_EXE_TUNING.CTL				
Z	Χ	Χ	Χ	N/A	RAMSETE.CTL				
Z	Χ	Χ	Χ	N/A	ROTATION2D.CTL				
Z	Χ	Χ	Χ	N/A	ROTATION3D.CTL				
Z	Χ	Χ	Χ	N/A	SIMPLE_MOTOR_FF.CTL				
Z	Χ	Χ	Χ	N/A	SINGLE JOINT ARM SIM.CTL				
Z	Χ	Χ	Χ	N/A	SLEW RATE LIMITER.CTL				
Z	X	Χ	X	N/A	SPLINE CTRL VECTOR.CTL				
Z	Х	Χ	Χ	N/A	SPLINE.CTL SPLINE				
Z	X	X	X	N/A	SWERVE DRIVE KINEMATICS.CTL				
Z	X	X	X	N/A	SWERVE DRIVE MODULE STATE.CTL				
Z	$\hat{x}$	X	$\overline{X}$	N/A	SWERVE DRIVE ODOMETRY.CTL				
Z	$\overline{X}$	X	$\overline{x}$	N/A	SWERVE DRIVE Pose EST.CTL				
Z	X	X	X	N/A	TIMER.CTL				
Z	X	X	X	N/A	TRAJ CONFIG.CTL				
Z	$\hat{x}$	X	$\hat{x}$	N/A	TRAJ_CONTIG.CTE  TRAJ_CONSTRAINT_CENTRIPETAL_ACCEL.CTL				
Z	$\hat{X}$	X	$\frac{\hat{x}}{X}$	N/A	TRAJ_CONSTRAINT_CENTRIFETAL_ACCEL.CTL  TRAJ_CONSTRAINT_DIIF_DRIVE_KINEMATICS.CTL				
Z	$\hat{X}$		$\frac{\hat{x}}{X}$	N/A	TRAJ_CONSTRAINT_DIIF_DRIVE_KINEMATICS.CTL  TRAJ_CONSTRAINT_DIIF_DRIVE_VOLTAGE.CTL				
	^	X	^	N/A N/A	TRAJ_CONSTRAINT_DIIF_DRIVE_VOLTAGE.CTL  TRAJ_CONSTRAINT_JERK.CTL	Doubles sylists it is just a shall			
7	\ <u> </u>	-	V			Routine exists, it is just a shell			
Z	X	X	X	N/A	TRAJ_CONSTRAINT_MECA_DRIVE_KINEMATICS.CTL				
Z	X	X	X	N/A	TRAJ_CONSTRAINT_MINMAX.CTL				
Z	X	X	X	N/A	TRAJ_CONSTRAINT_SWERVE_DRIVE_KINEMATICS.CTL				
Z	X	Χ	X	N/A	TRAJ_STATE.CTL				
Z	Χ	Χ	Χ	N/A	TRAJECTORY_SPLINE_TYPE_ENUM.CTL				
Z	Χ	Χ	Χ	N/A	TRAJECTORY.CTL				
Ζ	Χ	Χ	Χ	N/A	TRANSFORM2D.CTL				
Z	Χ	Χ	Χ	N/A	TRANSFORM3D.CTL				
Z	Χ	Χ		N/A	TRANSLATION2D.CTL				
Z	Χ	Χ	X	N/A	TRANSLATION3D.CTL				
Z	Χ	Χ	Χ	N/A	TRAPEZOID_PROFILE_CONSTRAINT.CTL				
Z	Χ	Χ	Χ	N/A	TRAPEZOID_PROFILE_STATE.CTL				
Z	Χ	Χ	Χ	N/A	TRAPEZOID_PROFILE.CTL				
Z	Χ	Χ	Χ	N/A	TWIST2D.CTL				
Z	Χ	Χ	Χ	N/A	TWIST3D.CTL				
Z	Χ	Χ	Χ	N/A	UNSCENTED_KALMAN_CORRECT_FUNC_GROUP.CTL				
Ζ	X	Χ	X	N/A	UNSCENTED KALMAN FILTER.ctl				
Z	X	X	X	N/A	UNSCENTED KALMAN NEW FUNC GROUP.CTL				
Z	X	X	X	N/A	UTIL PATHFINDER CONFIG.CTL				
N/A		N/A		N/A	WAYPOINTS.CTL	Delete – obsolete			
Z	Х	X	X	NA	WEIGHTED WAYPOINT.CTL	New V1.5			
N/A	- 1	N/A		N/A	X Y HEADINGS.CTL	Delete – obsolete			
Z	Х	X	X	N/A	X Y PAIR.CTL	Doloto obsolicto			
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