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

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

Doc completed Pct 99.01% Optimization Pct 56.68%

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

'===== BASE

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ANALOG DELAY			X Mem Item		Test Routine Sample Program		Function Prototype	Notes Similar to interpolated tree map	Code Review	Test Program	Error Checking
			Not WPILIB		Test Routine Sample Program		Function Prototype	Notes	Code Review	Test Program	Error Checking
BUMPLESS TRANSFER	X		X X			BumplessTransfer_Execute.vi					
		Documented	Not WPILIB	Execution Optimized	Test Routine Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
FUNCTION GENERATOR		X		1		FunctionGenerator_Add_Value.vi		Similar to interpolated tree map			
		X	X			FunctionGenerator_Add_XY.vi		Similar to interpolated tree map			
		X	X	1		FunctionGenerator_Calculate.vi		Similar to interpolated tree map			
		X		SI		FunctionGenerator_Clear.vi					
	X		$X \mid X$			FunctionGenerator_Execute.vi		Similar to interpolated tree map			
	X	X	X	SI		FunctionGenerator_New.vi		Similar to interpolated tree map			
			Not WPILIB Menu Item	4	Test Routine Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
FUNCTION GENERATOR MATRIX	X	X .	$X \mid X$	1		FunctionGeneratorMatrix_Add.vi	·	Similar to interpolated tree map			
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FRC_LabVIEW_Trajectory_Library_Routines.xlsx

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	Χ	X	X	X	SI		FunctionGeneratorMatrix_New.vi		Similar to interpolated tree map			
LEADLAG	Implemented	Documented	Not WPILIB		Execution Optimized	Test Routine	Sample Program Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
LEAD LAG	Χ		X	X			LeadLag_Execute.vi					
LINEAR FILTER	X	X X Documented	Not WPILIB	X X X	SI X	Test Routine	VI Name LinearFilter_BackwardFiniteDifference LinearFilter_Calculate.vi LinearFilter_CutoffFrequency.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	X	X	X				X LinearFilter_Execute.vi		Labview style helper			
	X X X X X X X X X	X X X X X X X X X X	X X X X	No X X X X X X X X X			LinearFilter_Factorial.vi LinearFilter_FiniteDifference.vi LinearFilter_HighPass.vi LinearFilter_HighPassBW1.vi LinearFilter_HighPassBW2.vi LinearFilter_LowPassBW1.vi LinearFilter_LowPassBW2.vi LinearFilter_MovingAverage.vi LinearFilter_New.vi LinearFilter_Reset.vi LinearFilter_ResetToValue.vi LinearFilter_SinglePoleIIR.vi		AN INTERNAL ROUTINE			
	X	X	X	X	X		LinearFilter TimeConst.vi					
MEDIAN FILTER	X X X Implemented	X X Documented	X Not WPILIB	X X X X	図 図 - X Execution Optimized		WedianFilter_ResetToValue.vi	Function Prototype	Notes Labview style helper	Code Review	Test Program	Error Checking
SLEW RATE FILTER	X X X X X	X X X	X	X X X X X X		Test Routine	VI Name SlewRateLimiter_Calculate.vi SlewRateLimiter_Close.vi X SlewRateLimiter_Execute.vi SlewRateLimiter_GetRate.vi SlewRateLimiter_New.vi SlewRateLimiter_NewInitialZero.vi SlewRateLimiter_Reset.vi SlewRateLimiter_SetRate.vi	Function Prototype	Notes Labview style helper	Code Review	Test Program	Error Checking

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	du,	Š Š	Ş.	ьщ	K VI Name	Function Prototype Notes	Š	Test	Error
TIME		\overline{X} \overline{X}	X		Timer Close.vi	releases semaphore			
		X	X		X Timer Get.vi				
	X	X X	X		Timer GetAndReset.vi				
	X	X X			Timer GetInternal.vi	Internal (private) only			
		X	X		X Timer HasPeriodPassed.vi	Y / 2			
		X X			X Timer HasPeriodPassedOnce.vi				
	X	X	X		X Timer New.vi				
		X	X		X Timer Reset.vi				
		X X			Timer ResetInternal	Internal (private) only			
		X	X		X Timer_Start.vi				
		X	X		X Timer_Stop.vi				
		X X			Timer_StopInternal.vi	Internal (private) only			
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TIME INTERPOLATABLE BOOLEA			X	1	TimeInterpBoolean_AddSample.vi	Update to use create matrix			
	X	XX	No	1	TimeInterpBoolean_CleanUp.vi	Update to use create matrix			
	X	XX	X		TimeInterpBoolean_Clear.vi				
	X	X X	X	1	TimeInterpBoolean_GetSample.vi			 	
	V	V V	V	0/	TimeInterpBoolean_GetTimeForValue.vi				
	X	X X	X	SI	TimeInterpBoolean_New.vi			 	
	X	X X	X	51	TimeInterpBoolean_SetMaxTime.vi				
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	X	$X \mid X$	X	SI	TimeInterpDouble_Clear.vi		O		
	X X X	$\begin{array}{c c} X & X \\ X & X \end{array}$	X	SI	TimeInterpDouble_Clear.vi TimeInterpDouble_GetSample.vi				
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FRC LabVIEW Trajectory Library - VI Implementation List Revision 2.X 11/06/2022 – added various routines Function Prototype TIME INTERPOLATABLE ROTATION2D TimeInterpRotation2d AddSample.vi Update to use create matrix TimeInterpRotation2d_CleanUp.vi Update to use create matrix TimeInterpRotation2d_Clear.vi X X X X I TimeInterpRotation2d_GetSample.vi TimeInterpRotation2d_GetTimeForValue.vi TimeInterpRotation2d New.vi X X X X SI TimeInterpRotation2d_SetMaxTime.vi X X X X SI Function Prototype VI Name Notes WAIT ADJUST X WaitAdjust.vi Function Prototype Notes DIGITAL SEQUENTIAL LOGIC X X X X DigSeqLogic_Delay.vi Χ X X X DigSeqLogic_On_Delay.vi Χ DigSeqLogic_Off_Delay.vi X X X X X X X X X X X DigSeqLogic_One_Shot.vi DigSeqLogic_SR_Flip_Flop.vi Function Prototype VI Name Notes DEBOUNCER X Debouncer New.vi X X Χ Debouncer_Calculate.vi XX XX Debouncer Execute.vi XX No Debouncer Reset.vi XX No Debouncer HasElapsed.vi '======== CONTROLLER '========

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Nample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
ARM FF	Χ	X		X			ArmFF_Calculate.vi					
	Χ	X		X			ArmFF_CalculateVelocityOnly.vi					

ous routines												
			X				ArmFF_Execute.vi		LabVIEW style single call			
			X				ArmFF_ExecuteVelocityOnly.vi		LabVIEW style single call			
		X		(ArmFF_MaxAchieveAccel.vi					
		X)				ArmFF_MaxAchieveVelocity.vi					
		X		(ArmFF_MinAchieveAccel.vi					
		X		(ArmFF_MinAchieveVelocity.vi					
	X	X		(ArmFF_New_ZeroGravity.vi					
	X	X)	(ArmFF_New.vi					
BANG BANG	X X X X X X X X X X X X X X X X X X X	X	X	(S (S (S (S (S (S		Sample Program	VI Name BangBang_AtSetpoint.vi BangBang_Calculate_PV.vi BangBang_Calculate_SP_PV.vi BangBang_Execute.vi BangBang_GetAll.vi BangBang_GetError.vi BangBang_New.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
		X X		(S	<i>!</i>		BangBang_SetSetpoint.vi BangBang_SetTolerance.vi					
	Implemented	Documented	Not WPILIB	iveria iterri Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
CONTROLLER UTIL		X	7				ControllerUtil_GetModulusError.vi	71	This was short lived in WPILIB, but still useful here.		,	
ELEV FF	X X X X X X	X	X X X)		Test Routine	Sample Program	VI Name ElevFF_Calculate.vi ElevFF_CalculateVelocityOnly.vi ElevFF_Execute.vi ElevFF_ExecuteVelocityOnly.vi ElevFF_MaxAchieveAccel.vi ElevFF_MaxAchieveVelocity.vi ElevFF_MinAchieveVelocity.vi ElevFF_MinAchieveVelocity.vi ElevFF_New_ZeroAccel.vi ElevFF_New.vi	Function Prototype	Notes LabVIEW style single call LabVIEW style single call	Code Review	Test Program	Error Checking
HOL_DRV_CTRL	X	X .	X \	(Sample Program	VI Name HolDrvCtrl_AdvCalculate_Trajectory.vi HolDrvCtrl_AdvCalculate.vi HolDrvCtrl_AtReference.vi	Function Prototype	Notes Added 1/24/2022 Added 1/24/2022 Added 1/26/21	Code Review	Test Program	Error Checking

	Χ	Χ	Χ	X				HolDrvCtrl Execute Trajectory.vi		Added 1/24/2022			
	Χ	Χ	Χ	X				HolDrvCtrl Execute.vi		Future			
	X	X		X	SI			HolDrvCtrl New.vi		Added 1/26/21			
	X	X	Χ	X				HolDrvCtrl PackExecuteSP.vi		133331,2021			
	X			X	 •			HolDrvCtrl PackPID.vi		Added 1/24/2022			
	X		X	X				HolDrvCtrl PackProfPID.vi		Added 1/24/2022			
	X	X		X	SI			HolDrvCtrl SetEnabled.vi		Added 1/26/21			
	X	X		X	SI			HolDrvCtrl SetTolerance.vi		Added 1/26/21			
l								TOIDIVOIII_OCTTOICIANCC.VI		Added 1/20/21			
PID AUTOTUNE	X X Implemented	Documented	X X Not WPILIB	No No No X	Execution Optimized	Test Routine	Sample Program	VI Name PIDAutoTune_ClosedLoopStep.vi PIDAutoTune_Convert_Academic_To_NonInteracting.vi PIDAutoTune_OpenLoopStep.vi PIDAutoTune_SetTuningArguments.vi PIDAutoTune_Step.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
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	mplemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program				Code Review	sst Program	Error Checking
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PID CONTROLLER	X	Χ	X	X				PIDController_AdvCalculate_FF_Sp_Pv_Per.vi		Advanced PID			
	X	Χ	Χ	X				PIDController_AdvCalculate_FF_Sp_Pv.vi		Advanced PID			
	X	Χ	X	X			X	PIDController_AdvExecute.vi		Labview style helper. Advanced			
										PID			
	X	Χ		X	SI			PIDController_AtSetpoint.vi					
	X	X		X				PIDController_Calculate_PV.vi					
	X	Χ		X				PIDController_Calculate_SP_PV.vi					
	X	Χ		Χ	SI			PIDController_DisableContinousInput.vi					
	Χ	Χ		X	SI			PIDController EnableContinousInput.vi					
	X	Χ	Χ	X			Χ	PIDController Execute.vi		Labview style helper			
								PIDController GetContinuousError.vi		OBSOLETE – Removed			
	Χ	Χ		Х	SI			PIDController GetPeriod.vi		OBCCETE INCINICACE			
	X	X		X	SI			PIDController GetPID.vi					
	X	X		X	SI			PIDController GetPositionError.vi					
	X	X		X				PIDController GetSetpoint.vi					
				^									
	X	X			SI			PIDController_GetTolerance.vi					
	X	X		X				PIDController_GetVelocityError.vi					
	X	X		X		-	-	PIDController_IsContinuousInputEnabled.vi					
	X	X		X		-	-	PIDController_New.vi					
	X	X		X		-	-	PIDController_NewPeriod.vi					
	X		X	X		-	-	PIDController_Pack_AdvLimits.vi					
	X	X		X	SI			PIDController_Pack_AdvTuning.vi					
	X		Χ	X	SI			PIDController_Pack_ErrorTolerance.vi					
	Χ		Χ	X				PIDController_Pack_InputLimits.vi					
	Χ		Χ					PIDController_Pack_Tuning.vi					
	X	Χ		X				PIDController_Reset.vi					
	X	Χ		X	SI			PIDController_SetD.vi					
	X	Χ	Χ	X	SI			PIDController_SetDerivativeFilter.vi		Advanced PID			
	Χ	X	X	No				PIDController_SetFeedForward_OBSOLETE_DELETE.vi		Advanced PID, Obsolete – DELETE			
	X	X	X	No				PIDController_SetFFGain_OBSOLETE_DELETE.vi		Advanced PID, Obsolete – DELETE			
	У	X		Y	SI			PIDController_Setl.vi					
	^	^		^	JI			PIDController_SetInputRange.vi	+	OBSOLETE – Removed			
	Χ	Х		Χ	SI			PIDController_SetInputRange.vi		ODGOLL I E - Mellioved			
	X		X	X	SI			PIDController SetOutputLimits.vi		Advanced PID			
			^				-	PIDController SetOutputLimits.vi		Auvaliceu FID			
	X	X	X	X	SI	-	-	PIDController SetPeriod.vi					
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X X SI PIDController SetTolerance vi			
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X X X SI PIDController_SetTolerancePan	ndV.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype Notes		Code Review	Test Program	Error Checking
PROFILED PID CONTROLLER	X	X		X	SI		ProfiledPIDController_AtGoal.vi					
	Χ	X		Χ	SI		ProfiledPIDController_AtSetpoint.vi					
	Χ	X		Χ			ProfiledPIDController_Calculate_Meas_Goal.vi					
	Χ	Χ		X			ProfiledPIDController_Calculate_Meas_StateGoal_TrapCnsrt.vi					
	Χ	X		X			ProfiledPIDController_Calculate_Meas_StateGoal.vi					
	Χ	Χ		X			ProfiledPIDController_Calculate_Meas.vi					
	Χ	Χ		X	SI		ProfiledPIDController_DisableContInput.vi					
	Χ	X		Χ	SI		ProfiledPIDController_EnableContInput.vi					
	Χ	X	X	X	1		ProfiledPIDController_Execute.vi	Single call LabVIEW st	tyle function.			
	X	Χ		X	SI		ProfiledPIDController_GetGoal.vi					
	Χ	Χ		X	SI		ProfiledPIDController_GetPeriod.vi					
	Χ	Χ	Χ	X	SI		ProfiledPIDController_GetPID.vi	WPILIB has separate of	getters.			
	Χ	Χ		X	SI		ProfiledPIDController_GetPositionError.vi					
	Χ	Χ		X	SI		ProfiledPIDController_GetSetpoint.vi					
	X	Χ			SI		ProfiledPIDController_GetTolerance.vi					
	Χ	X		X	SI		ProfiledPIDController_GetVelocityError.vi					
	Χ	X		X	1		ProfiledPIDController_New.vi					
	Χ	X		X	1		ProfiledPIDController_NewPeriod.vi					
	Χ	X		X	SI		ProfiledPIDController_Reset_PosOnly.vi					
	Χ	Χ		X	SI		ProfiledPIDController_Reset_PosVel.vi					
	Χ	Χ		Χ	SI		ProfiledPIDController_Reset.vi					
	Χ	X		X	SI		ProfiledPIDController_SetConstraints.vi					
	Χ	X		X	SI		ProfiledPIDController_SetGoal_PosOnly.vi					
	Χ	Χ		X	SI		ProfiledPIDController_SetGoal.vi					
	Χ	X		X	SI		ProfiledPIDController_SetIntegratorRange.vi					
	Χ	X		X	SI		ProfiledPIDController_SetPID.vi					
	Χ	X		X	SI		ProfiledPIDController_SetTolerance_PosOnly.vi					
	Χ	Χ		X	SI		ProfiledPIDController_SetTolerance_PosVel.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
RAMSETE	Χ	X		Χ	SI		Ramsete_AtReference.vi	AtReference				
	X	X		Χ	Χ		Ramsete_Calculate_Trajectory.vi	calculate_trajectory				
	Χ	X		Χ	Χ		Ramsete_Calculate.vi	calculate				
	Χ	X	Χ	Χ	Χ		Ramsete_Diff_DO_Eng.vi					
	Χ	X	X	Χ	Χ		Ramsete_Diff_DO_SI.vi					
	Χ	X	Χ	Χ	1		Ramsete_Execute_ENG.vi	Use this one!!				
	Χ	X	Χ	Χ	SI		Ramsete_Execute_PackTuning_ENG.vi					
	Χ	X	Χ	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		Χ	X		Ramsete SINC.vi	sinc	internal		ļ	

FRC LabVIEW Trajectory Library – VI Implementation	n List											
Revision 2.X 11/06/2022 – added various routines	LIST											
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	əJdι	noo	Not N	Menu Execu	est I	атр				ode	Test I	Error
SIMPLE MOTOR FEEDFORWAR	=	X		Σ úì X Si		_ ഗ്	VI Name SimpleMotorFF_Calculate_CalcAccel.vi	Function Prototype	Notes		<u>F</u>	Ш
SIMIT LE MOTORT LEDI GRAVAR	X	X		X 3			SimpleMotorFF Calculate NextV Dt.vi					
	X	X		X S			SimpleMotorFF_Calculate.vi	public double calculate(double velocity, double acceleration)				
	X	X		X S	<u>'</u>		SimpleMotorFF_CalculateVelocityOnly.vi	public double calculate(double velocity)				
	X	X	X	XX			SimpleMotorFF_Ka_AutoTune.vi SimpleMotorFF_MaxAchieveAccel.vi	public double maxAchievableAcceleration(double maxVoltage,				
								double velocity)				
	X	X		X			SimpleMotorFF_MaxAchieveVel.vi	public double maxAchievableVelocity(double maxVoltage, double acceleration)				
	X	X		X			SimpleMotorFF_MinAchieveAccel.vi	public double minAchievableAcceleration(double maxVoltage,				
	X	X		XX			SimpleMotorFF_MinAchieveVel.vi	double velocity) public double minAchievableVelocity(double maxVoltage, double				
								acceleration)				
	X	X		X S	'		SimpleMotorFF_New.vi	public SimpleMotorFeedforward(double ks, double kv, double ka)				
	X	X	X	S	'		SimpleMotorFF_Pack_Ka_Tune_Params.vi					
								public SimpleMotorFeedforward(double ks, double kv)				
								passo emponent ocalor nais (acasie no, acasie ni)			1	
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GEOMETRY '=======												
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	plemente	ocumente	W :	ru It Cutii	. R	əJdι				e R	r. P	õ
	dm	Doc	Vot WPILIB	Menu Iten Execution	Test Routine	Sample Progi	VI Name	Function Prototype	Notes	Code Reviev	Test	Error
COORDINATE AXIS		X		X S	1		CoordAxis_D.vi					7
	X	X		X S			CoordAxis_E.vi					
	X	X		X S			CoordAxis_N.vi CoordAxis New.vi					
	X	X		X S	1		CoordAxis S.vi					
	X	X		X S	'		CoordAxis_U.vi CoordAxis_W.vi					
	X	X		X S	'		CoordAxis_W.vi					
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	ente	nte	LIB	# C	uţi	Pro				evie	gra	Checking
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	ηdμ	Documen	, ot	Menu Iten Execution	Test Routine	Sample Prog	VI Name	Function Prototype	Notes	Code Reviev	Test	Erroi
COORDINATE SYSTEM	1 X	X			\overline{X}		CoordSystem_Convert_Pose3d.vi	T unction i rototype	140103			Щ_
	X	X		X S	'		CoordSystem_Convert_Rotation3d.vi					
	X	X		X S			CoordSystem_Convert_Translation3d.vi					
	X	X		X Si	' X		CoordSystem_Convert_Transform3d.vi CoordSystem_EDN.vi					
	X	X		X S	$\frac{x}{X}$		CoordSystem_NED.vi					
	X	Χ		X S	' X		CoordSystem_New.vi					
	X	X		X S	' X		CoordSystem_NWU.vi					
				ized								
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	ente.	ınte	ILIE			Pro				evíe	уgrа	лес/
	eme	пше	WP.	u Iț. :ufic	' est Routine	ple				e Ā	Pro	Ç
	Implementec	Documentec	Not WPILIB	Menu Iten Execution	rest	Sample Prog	VI Name	Function Prototype	Notes	Code Revien	Test Progra	Error Checking
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l Implementati	on List												
outines								D 01 D 10					I
POSE					SI			Pose2d_Div.VI	hadaan amada (athanati)				
	X			X	SI			Pose2d_Equals.VI Pose2d_Exp.vi	boolean equals(other obj) pose2d exp(twist2d twist)				
	X			X	X SI			Pose2d_exp.vi Pose2d_getRotation.vi	rotation2d getRotation()	can also use cluster unpack			
	X			$\frac{\lambda}{X}$	SI			Pose2d_getTranslation.vi	translation2d getTranslation()	can also use cluster unpack			
	X			X	SI			Pose2d_getXY.vi	translation2d getTranslation()	carr also use cluster unpack			
	X			X	SI			Pose2d_getXYAngle.vi					
	X			X	1			Pose2d_Interpolate.vi					
	X			X	Χ			Pose2d_Log.vi	twist2d log(pose2d end)				
	X			X	SI			Pose2d Minus.vi	transform2d minus(pose2d other)				
	X			X	SI			Pose2d_New_TRRO.vi	pose2d new(translation2d, rotation2d)				
	X			X	SI			Pose2d_New.vi	pose2d new(double x, double y, rotation2d)				
	X			X	SI			Pose2d_Plus.vi	pose2d plus(transform2d other)				
	X			X	SI			Pose2d_RelativeTo.vi	pose2d relativeto(pose2d other)				
	X				SI			Pose2d_Times.vi					
	X	X		X	SI			Pose2d_TransformBy.vi	pose2d transformby(transform2d other)				
									pose2d new()	can use cluster constant			
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
POSE			_<	2	SI		S	Pose3d Div.vi	r difction Prototype	Notes		7	
1 001.	$\frac{\lambda}{X}$			X	SI			Pose3d_Equals.VI					
	X			$\frac{X}{X}$	X			Pose3d_Exp.vi					
	X			X	SI			Pose3d_getRotation.vi					
	X			X	SI			Pose3d_getTranslation.vi					
	X			X	SI			Pose3d_getXYZ.vi					
	X	X		X	1			Pose3d_Interpolate.vi					
	X	X		X	Χ			Pose3d_Log.vi					
	X			X	SI			Pose3d_Minus.vi					
	X			X	SI			Pose3d_New.vi					
	X			X	SI			Pose3d_New_Default.vi					
	X				SI			Pose3d_New_Pose2d.vi					
	X			X	SI			Pose3d_New_Trans3dRot3d.vi					
	X			X	SI			Pose3d_Plus.vi					
	X			X	SI			Pose3d_RelativeTo.vi Pose3d_RotationVectorToMatrix.vi					
	X			No X	SI SI			Pose3d ToPose2d.vi					
				^	SI			Pose3d_Times.vi					
	X	X		X				Pose3d_TransformBy.vi					
								r oood_manelomby.vi					
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program				Code Review	Test Program	ır Checking
	ıdır	. 20	√ot	/ler	ž	es	san	VI Name	Function Prototype	Notes	90	es.	Error
QUATERNIC			_ <	_ <u><</u>	SI		ر ت	Quaternion_Equals.vi	1 and an interpretation	110.00	\top		
~57.1. E13110	$X \rightarrow X$		+	X	SI			Quaternion_Equals.vi			1		
	X			X	SI			Quaternion_Get_LVQuat.vi					
	X			X	SI			Quaternion_Get_Vect.vi					
	X			X	SI			Quaternion_Get_W.vi					
	X	X		X	SI			Quaternion_Inverse.vi					
	X			X	SI			Quaternion_New.vi					
	X			X	SI			Quaternion_New_Default.vi					
	X			X	SI			Quaternion_New_LVQuat.vi					
	X			X	SI			Quaternion_Normalize.vi					
	X		-	X	SI			Quaternion_Plus.vi					
	X			X	SI SI			Quaternion_Times.vi Quaternion ToRotationVector.vi					
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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	NI Name	Function Protetyno	Notes	Code Review	Test Program	20170000
TATION2D	X	X	_<	_≥ X	SI	F (Rotation2d_CreateAngle.vi	Function Prototype rotation2d new(double value)	Notes			<u>u</u>
TATION2D	X	X		X	SI		Rotation2d_CreateAngleDegrees.vi	rotation2d frew(double value) rotation2d fromDegrees(double degrees)	convert to radians then create			
	X	X		X	SI		Rotation2d_CreateAngleRotations.vi	Totalionza Hombogroco (double degroco)	Sometic radians then oreate			
	X	X		X	SI		Rotation2d CreateXY.vi	rotation2d new(double x, double y)				
	Χ	Χ			SI		Rotation2d_Div.vi					
	Χ	Χ		Χ	SI		Rotation2d_Equals.vi	boolean equals(rotation2d other)				
	X	X	Χ	X	SI		Rotation2d_GetAngleCosSin.vi		New 1/26/21			
	X	X		X	SI SI		Rotation2d_GetCos.VI	double getCos()	use cluster unpack			
	X	<i>x</i>		^	31		Rotation2d_GetDegrees.VI	double getDegrees()	use cluster unpack, then convert to degree			
	Χ	Χ		Χ	SI		Rotation2d GetRadians.VI	double getRadians()	use cluster unpack			
	Χ	Χ		X	SI		Rotation2d_GetRotations.vi	y v	·			
	Χ	Χ		Χ	SI		Rotation2d_GetSin.VI	double getSin()	use cluster unpack			
	X	Χ		Χ	SI		Rotation2d_GetTan.VI	double getTan()	can calculate			
	X	X		X	SI		Rotation2d_Interpolate.vi	45.01 (45.01 (1)				-
-	X	X		X	SI SI		Rotation2d_Minus.vi Rotation2d Plus.vi	rotation2d minus(rotation2d other) rotation2d plus(rotation2d other)				-
	X	X		\hat{x}	SI		Rotation2d RotateBy.vi	rotation2d rotateby(rotation2d other)				
	X	X		X	SI		Rotation2d Times.vi	rotation2d times(double scalar)				
	X	X		X	SI		Rotation2d_UnaryMinus.vi	rotation2d unaryminus()				
							<u> </u>	rotation2d new()	can use cluster constant			
	Implemented	=			#	8				Rev	Progi	
	2	Досі	Not WPILIB	Menu Item	Execution Optimizea	Test Routine	Name	Function Prototype	Notes	Code Review	Test Program	
ATION3D	Χ	X Documentea	Not M	Χ	SI	Test Ro	Rotation3d_Create_AxisAngle.vi	Function Prototype	Notes	Code Rev		
ATION3D	X	X	Not N	X	SI SI	Test Ro	Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi	Function Prototype	Notes	Code Rev		
ATION3D	X X X	X X X	Not M	X X X	SI SI SI	Test Ro	Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi	Function Prototype	Notes	Code Rev		
ATION3D	X X X	X X X	Not W	X X X	SI SI SI I	Test Ro	Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi	Function Prototype	Notes	Code Rev		
ATION3D	X X X X	X X X X	Not M	X X X X	SI SI SI	Test Ro	Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi Rotation3d_Create_RollPitchYaw.vi	Function Prototype	Notes	Code Rev		
ATION3D	X X X X X	X X X X X	Not M	X X X	SI SI I SI	Test Ro	Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi Rotation3d_Create_RollPitchYaw.vi Rotation3d_Create_RotMatrix.vi	Function Prototype	Notes	Code Rev		
ATION3D	X X X X X X X	X X X X X X X		X X X X X	SI SI I SI I SI SI	Test Ro	Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi Rotation3d_Create_RollPitchYaw.vi Rotation3d_Create_RotMatrix.vi Rotation3d_Div.vi Rotation3d_Equals.vi	Function Prototype	Notes	Code Rev		
ATION3D	X X X X X X X X	X X X X X X X X	X Not W	X X X X X X	SI SI SI I SI SI SI SI	Test Ro	Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi Rotation3d_Create_RollPitchYaw.vi Rotation3d_Create_RotMatrix.vi Rotation3d_Div.vi Rotation3d_Equals.vi Rotation3d_GetAxisAngle.vi	Function Prototype	Notes	Code Rev		
ATION3D	X X X X X X X X X	X X X X X X X X		X X X X X X X	SI SI I SI SI SI SI SI SI SI SI	Test Ro	Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi Rotation3d_Create_RollPitchYaw.vi Rotation3d_Create_RotMatrix.vi Rotation3d_Div.vi Rotation3d_Equals.vi Rotation3d_GetAxisAngle.vi Rotation3d_GetQuaternion.vi	Function Prototype	Notes	Code Rev		
ATION3D	X X X 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	Test Ro	Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi Rotation3d_Create_RollPitchYaw.vi Rotation3d_Create_RotMatrix.vi Rotation3d_Div.vi Rotation3d_Equals.vi Rotation3d_GetAxisAngle.vi Rotation3d_GetQuaternion.vi Rotation3d_GetXYZ.vi	Function Prototype	Notes	Code Rev		
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ATION3D	X X X X X X X X X X X X X X X X X X 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	Test Ro	Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi Rotation3d_Create_RollPitchYaw.vi Rotation3d_Create_RotMatrix.vi Rotation3d_Div.vi Rotation3d_Equals.vi Rotation3d_GetAxisAngle.vi Rotation3d_GetQuaternion.vi Rotation3d_GetXYZ.vi Rotation3d_Interpolate.vi Rotation3d_Minus.vi	Function Prototype	Notes	Code Rev		
ATION3D	X X X X X X X X X X X X	X X X X X X X X X X X		X X X X X X X X X X	SI SI SI SI SI SI SI SI	Test Ro	Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi Rotation3d_Create_RollPitchYaw.vi Rotation3d_Create_RotMatrix.vi Rotation3d_Div.vi Rotation3d_Equals.vi Rotation3d_GetAxisAngle.vi Rotation3d_GetQuaternion.vi Rotation3d_GetXYZ.vi Rotation3d_Interpolate.vi	Function Prototype	Notes	Code Rev		
ATION3D	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X		X X X X X X X X X X X X X X X X X X X	SI SI SI SI SI SI SI SI	Test Ro	Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi Rotation3d_Create_RollPitchYaw.vi Rotation3d_Create_RotMatrix.vi Rotation3d_Div.vi Rotation3d_Equals.vi Rotation3d_GetAxisAngle.vi Rotation3d_GetQuaternion.vi Rotation3d_GetXYZ.vi Rotation3d_Interpolate.vi Rotation3d_Minus.vi Rotation3d_Plus.vi Rotation3d_RotateBy.vi Rotation3d_Times.vi	Function Prototype	Notes	Code Rev		
ATION3D	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X		X X X X X X X X X X X X X X X X X X X	SI SI SI SI SI SI SI SI	Test Ro	Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi Rotation3d_Create_RollPitchYaw.vi Rotation3d_Div.vi Rotation3d_Equals.vi Rotation3d_GetAxisAngle.vi Rotation3d_GetQuaternion.vi Rotation3d_GetXYZ.vi Rotation3d_Interpolate.vi Rotation3d_Minus.vi Rotation3d_Plus.vi Rotation3d_RotateBy.vi Rotation3d_Times.vi Rotation3d_ToRotation2d.vi	Function Prototype	Notes	Code Rev		
TATION3D	X X X X X X X X X X X X X X X X X X 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	Test Ro	Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi Rotation3d_Create_RollPitchYaw.vi Rotation3d_Create_RotMatrix.vi Rotation3d_Div.vi Rotation3d_Equals.vi Rotation3d_GetAxisAngle.vi Rotation3d_GetQuaternion.vi Rotation3d_GetXYZ.vi Rotation3d_Interpolate.vi Rotation3d_Minus.vi	Function Prototype	Notes	Code Rev		
'ATION3D	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X		X X X X X X X X X X X X X X X X X X X	SI SI SI SI SI SI SI SI		Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi Rotation3d_Create_Quaternion.vi Rotation3d_Create_InitialFinalVector.vi Rotation3d_Create_RollPitchYaw.vi Rotation3d_Create_RotMatrix.vi Rotation3d_Div.vi Rotation3d_Equals.vi Rotation3d_GetAxisAngle.vi Rotation3d_GetQuaternion.vi Rotation3d_GetXYZ.vi Rotation3d_Interpolate.vi Rotation3d_Minus.vi Rotation3d_Plus.vi Rotation3d_RotateBy.vi Rotation3d_Times.vi	Function Prototype	Notes	Code Review Code Rev		

us routines									_				
	X	X			SI			Transform2d_Div.vi					
	X	Χ		X	SI			Transform2d_Equals.VI	boolean equals(other transform2d)				
	X	X		X	SI			Transform2d_GetRotation.VI	rotation2d getRotation()	use cluster unpack			
	X	X		X	SI			Transform2d_GetTranslation.VI	translation2d getTranslation()	use cluster unpack			
	X	X	X	X	SI			Transform2d_GetXY.vi					
	X	X	Χ	X	SI			Transform2d_GetXYAngle.vi	.				
	X	X		X	SI			Transform2d_Inverse.vi	transform inverse()	new			
	X	X		X	Si SI			Transform2d_Plus.vi	Annuaria was Oal Airea a a alau iki a a a alau i				
	X	Χ		Х	51			Transform2d_Times.vi	transform2d times(double scalar) transform2d new()	can use cluster constant			
l									transioniizu new()	can use cluster constant			
TRANSFORM3D	X X X X X X X X X X X X X X X 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	Si S	Test Routine	Sample Program	VI Name Transform3d_Create_Default.vi Transform3d_Create_Pose3dPose.3dvi Transform3d_Create_Trans3dRot3d.vi Transform3d_Div.vi Transform3d_Equals.VI Transform3d_GetRotation3d.VI Transform3d_GetTranslation3d.VI Transform3d_GetXYZ.vi Transform3d_Inverse.vi Transform3d_Plus.vi Transform3d_Times.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
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	mplementea	Documentea	Not WPILIB	Menu Item	Execution O	Test Routine	Sample Pro	V/ Name	Cunation Proteture	Notes	Code Review	est Prograi	Error Checking
TRANSLATION2D		X		_ <u>≥</u>	SI		S	VI Name Translation2d_Create_DistAng.vi	Function Prototype	Notes	S S		Щ
TRANSLATIONZD	$\frac{\lambda}{X}$	X		X	SI			Translation2d Create_Distang.vi	translation2d new(double x, double y)				
	X	X		^	SI			Translation2d Div.vi	translationzd new(double x, double y)				
	X	X		Χ	SI			Translation2d Equals.vi	boolean equals(translation other)				
	X	X		$\frac{\lambda}{X}$	SI			Translation2d GetAngle.vi	boolean equals(translation other)				
	X	X		X	SI			Translation2d_GetDistance.vi	double getDistance(translation2d other)				
	X	X		X	SI			Translation2d_GetNorm.VI	double getNorm()	can use cluster unpack			
	X	X		X	SI			Translation2d GetX.VI	double getX()	can use cluster unpack			
	X	X	Χ	X	SI			Translation2d GetXY.VI	V	,			
	X	Χ		Χ	SI			Translation2d_GetY.VI	double getY()	can use cluster unpack			
	X	Χ		Χ	SI			Translation2d_Interpolate.vi	- "	·			
	X	Χ		Χ	SI			Translation2d_Minus.vi	translation2d minus(translation2d other)				
	Χ	Χ		Χ	SI			Translation2d_Plus.vi	translation2d plus(translation2d other)				
	Χ	Χ		Χ	SI			Translation2d_RotateBy.vi	translation2d rotateBy(rotation2d other)				
	X	Χ		Χ	SI			Translation2d_Times.vi	translation2d times(double scalar)				
	Χ	Χ		Χ	SI			Translation2d_UnaryMinus.vi	translation2d unaryminus()				
									translation2d new()	can use cluster constant			
									translation2d div(double scalar)	can multiply by 1/scalar			
	pe	<i>p</i> e.	8		Optimized	ine	rogram				,ew	ram	. Checking
	ıplement	ocument	ot WPILIB	enu Item	recution	est Rout	M eldme				ode Rev	est Prog	ror Che
TRANSLATION3D	\times Implemented	X Documentea	Not WPIL	X Menu Item	ର Execution	Test Routine	Sample P.	VI Name Translation3d Create.vi	Function Prototype	Notes	Code Review	Test Prog	Error Che

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

XX		X	SI	Translation3d_Create_DistAng.vi	
XX		Χ	SI	Translation3d_Div.vi	
XX		Χ	SI	Translation3d_Equals.vi	
XX		Χ	SI	Translation3d_GetDistance.vi	
XX		Χ	SI	Translation3d_GetNorm.VI	
XX	Χ	Χ	SI	Translation3d_GetXYZ.vi	
XX		Χ	SI	Translation3d_Interpolate.vi	
XX		Χ	SI	Translation3d_Minus.vi	
XX		Χ	SI	Translation3d_Plus.vi	
XX		Χ	SI	Translation3d_RotateBy.vi	
XX		Χ	SI	Translation3d_Times.vi	
XX		Χ	SI	Translation3d_ToTranslation2d.vi	
XX		Χ	SI	Translation3d UnaryMinus.vi	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimizea	Test Routine	Nample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
TWIST2D	X	X		X	SI		Twist2d_Create.vi	twist new(x, y, theta)				
	Χ	X		Χ	SI		Twist2d_Equals.VI	boolean equals(obj other)				
	X	X	Χ	Χ	SI		Twist2d_GetAll.VI					
					7							

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
TWIST3D	Χ	X		X	SI	Χ	Twist3d_Create.vi					
	Χ	X		Χ	SI	Χ	Twist3d_Equals.VI					
	X	Y	Y	Y	SI	Y	Twist3d GetAll VI					

diffDriveWheelSpeed toWheelSpeeds(chassisSpeeds)

'======== **KINEMATICS** '======== Function Prototype Notes CHASSIS SPEEDS X ChassisSpeeds_FromFieldRelativeChassisSpeeds.VI SI ChassisSpeeds_FromFieldRelativeSpeeds.VI chassisspeeds fromFieldRelativeSpeeds(double x, double y, double angvel, rotation2d robotangle) ChassisSPeeds_GetXYOmega.vi X X X X SI X SI ChassisSpeeds_New.vi chassisspeeds new (double xvel, double yvel, double angvel) can use cluster constant chassisspeeds new () Function Prototype Notes DIFFERENTIAL DRIVE KINEMATICS X DiffKinematics_New.vi diffDriveKine new(double trackWidth) X I X Χ Χ Χ X X X DiffKinematics_toChassisSpeed.vi chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds)

XX

X SI X

DiffKinematics_toWheelSpeed.vi

Revision 2.X 11/06/2022 – added various routines Function Prototype **DIFFERENTIAL DRIVE ODOMETRY** DiffOdometry Execute.vi DONT NEED Χ DiffOdometry_Update.vi pose2d update(rotation2d gyro, double leftdist, double right dist) Incorporates enhanced reset diffDrOdom new(rotation gyro, pose initial) diffDrOdom new(rotation gyro) void resetPosition(pose2d, rotation2d) incorporated into "update" pose2d getPoseMeters() Function Prototype Notes DIFFERENTIAL DRIVE WHEEL SPEEDS diffDrWheelSpeeds new() diffDrWheelSpeeds new(double leftVel, double rightVel) XX Χ DiffWheel Normalize.vi void normalize(double maxVel) Function Prototype Notes MECANUM DRIVE KINEMATICS X X MecaKinematics New.vi X X X X X X Χ MecaKinematics SetInverseKinematics.vi Χ MecaKinematics ToChassisSpeeds.vi MecaKinematics_ToTwist2d.vi Χ X X MecaKinematics_ToWheelSpeeds.vi Χ X X Χ MecaKinematics_ToWheelSpeedsZeroCenter.vi VI Name Function Prototype Notes MECANUM DRIVE MOTOR VOLTAGE nothing done Function Prototype Notes MECANUM DRIVE ODOMETRY MecaOdometry_Execute.vi MecaOdometry_GetKinematics.vi X X X MecaOdometry_GetPose.vi X X MecaOdometry New.vi X XX Χ MecaOdometry NewDefaultPose.vi XX Χ MecaOdometry_Reset.VI MecaOdometry Update.vi X XX MecaOdometry_UpdateWithTime.vi Removed...

### ACANUM DRIVE WHEEL POSTION A	Review Code Review Code Review	Test Program Test Program	Error Checking Error Checking
RECANUM DRIVE WHEEL POSITION X X X X S S	Review Code Review Code	Test Program Test Program	Checking
MECANUM DRIVE WHEEL SPEEDS ME	Review	Test Program	Error Checking
MECANUM DRIVE WHEEL SPEEDS Note	Review	Test Program	Error Checking
MECANUM DRIVE WHEEL SPEEDS ME	Review	Test Program	Error Checking
MECANUM DRIVE WHEEL SPEEDS ME	Review	Test Program	Error Checking
X	Review		
SWERVE DRIVE KINEMATICS X X X X X SwerveKinematics Normalize(Normalize vi public static void normalize(House) states (ChassisSpeeds MetersPerSecond) Function Prototype Function Prototype Function Prototype Notes SwerveKinematics New4.VI X X X X X X SwerveKinematics New4.VI X X X X X X SwerveKinematics New2.VI X X X X X X SwerveKinematics NormalizeWheelSpeeds.vi public static void normalizeWheelSpeeds(SwerveModuleState] moduleStates, double attainableMaxSpeedMetersPerSecond) X X X X X X SwerveKinematics ToChassisSpeeds4.VI X X X X X SwerveKinematics ToChassisSpeeds4.VI public SwerveModuleState[] toSwerveModuleState[] toS	Review		
SWERVE DRIVE KINEMATICS X X X X X X S SwerveKinematics New3.VI X X X X X X X S SwerveKinematics New3.VI SwerveKinematics ToChassisSpeeds.VI X X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X X S SwerveKinematics ToChassisSpeeds.VI X X X X X X X X SwerveKinematics ToChassisSpeeds.VI X X X X X X X X X X SwerveKinematics NewX.VI X X X X	Review		
SWERVE DRIVE KINEMATICS X	Review		
X	Code	Test Program	Error Checking
SwerveKinematics_NormalizeWheelSpeeds.vi public static void normalizeWheelSpeeds(SwerveModuleState[] moduleStates, double attainableMaxSpeedMetersPerSecond) For 4 module drives			+
ModuleStates, double attainableMaxSpeedMetersPerSecond For 4 module drives			+
X			
X			+
SwerveKinematics_ToSwerveModuleStates.VI			1
X X <td></td> <td></td> <td></td>			
X X <td></td> <td></td> <td></td>			
X X X SwerveKinematics_ToTwist2dX.VI public SwerveDriveKinematics(Translation2d wheelsMeters) variable parameters (replace with array and "4" calls) public ChassisSpeeds toChassisSpeeds(SwerveModuleState variable parameters (replace with variable parameters (replace with variable parameters)	\longrightarrow		+
public SwerveDriveKinematics(Translation2d wheelsMeters) variable parameters (replace with array and "4" calls) public ChassisSpeeds toChassisSpeeds(SwerveModuleState variable parameters (replace with array and "4" calls)			+
public ChassisSpeeds to ChassisSpeeds (SwerveivioduleState variable parameters (replace with wheelStates)			
wheelotates) array and 4 calls)			
Moto William And Moto Moto Moto Moto Moto Moto Moto Mot	Code Review	Test Program	Error Checking
SWERVE DRIVE ODOMETRY SwerveOdometry_Execute4.vi			
SwerveOdometry_ExecuteX.vi			
X X X SwerveOdometry_GetPosition.VI public Pose2d getPoseMeters()	,		
X X X SwerveOdometry_New.VI public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) X X X X X SwerveOdometry_NewZeroCenter.VI public SwerveDriveOdometry(SwerveDriveKinematics kinematics, public SwerveDriveOdometry(SwerveDriveKinematics kinematics, public SwerveDriveOdometry(SwerveDriveKinematics, public SwerveDriveOdometry(SwerveDriveKinematics, public SwerveDriveOdometry(SwerveDriveKinematics, public SwerveDriveOdometry(SwerveDriveKinematics, public SwerveDriveOdometry(SwerveDriveKinematics, public SwerveDriveOdometry(SwerveDriveKinematics, public SwerveDriveKinematics, p			
Rotation2d gyroAngle)			
X X SwerveOdometry_ResetPosition.VI public void resetPosition(Pose2d pose, Rotation2d gyroAngle)			
X X X X SwerveOdometry_Update4.VI For 4 module drives			

Revision 2.X 11/06/2022 – added various routines				DE1101/ED			
		SwerveOdometry_UpdateWithTime4.VI		REMOVED	-		
	Y V	SwerveOdometry_UpdateWithTimeX.VI		REMOVED			
$X \mid X \mid X$	X	SwerveOdometry_UpdateX.VI	and in December 201 and 14 With Time (december 201) and 15 and 15	uses array as input			
			public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates)	variable parameters (replace with array and "4" calls)			
			public Pose2d update(Rotation2d gyroAngle.	variable parameters (replace with			
			public Pose2d update(Rotation2d gyroAngle, SwerveModuleState moduleStates)	array and "4" calls)			
			· · · · · · · · · · · · · · · · · · ·		•		
mplemented Documented Not WPILIB	Menu Item Execution Optimized Test Routine Sample Program				eview	ogram	hecking
	u Ite Ple Ple				Œ O	<u>q</u>	Ó
Impleme Docume	Wenu Iten Execution Test Routi Sample P.				oqe	Test	10
		VI Name	Function Prototype	Notes	് _	<u> </u>	En
SWERVE DRIVE MODULE POSITIONS X X	X SI	SwerveModulePosition_CompareTo.vi					
X X		SwerveModulePosition_Get.vi					
X X	X SI	SwerveModulePosition_New.vi					
SMELA DUNCH MODULE STATE X X Not WPILIB	# 0 0 Z	VI Name SwerveModuleState CompareTo.vi	Function Prototype public int compareTo(SwerveModuleState o)	Notes	Code Review	Test Program	Error Checking
			public in compare ro(swervelylodulestate o)		-		
X X	X SI	SwerveModuleState_Get.vi	mushia Curamia Madula Ctata (da uhla ana ad Matana Dan Casana d				
$X \mid X$	X SI	SwerveModuleState_New.vi	public SwerveModuleState(double speedMetersPerSecond, Rotation2d angle)				
XX	X SI	SwerveModuleState_Optimize.vi	public SwerveModuleState optimize(SwerveModuleState desired	4			
	^ 31	SwerverrioddieState_Optimize.vi	Rotation2d angle)	4,			
			totationza angle				
'======== SPLINE '====================================	em on Optimized utine Program				iew	am	cking
nplementec ocumentea	fenu Item :xecution Op :est Routine				ge/	, 00	,he
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	Men Exe Test	VI Name	Function Prototype	Notes	000	e S	2TI:
CUBIC HERMITE SPLINE	N N N N N N N N N N N N N N N N N N N	VITAGIIC	protected SimpleMatrix getCoefficients()	not needed, use cluster unpack	<u> </u>	<u> </u>	<u>H</u>
X X	X	CubicHermiteSpline_getControlVectorFromArrays.vi	private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector)	not needed, use diuster unpack			
X X	X	CubicHermiteSpline_makeHermiteBasis.vi	private SimpleMatrix makeHermiteBasis()				
X X	X	CubicHermiteSpline_New.vi	<pre>public CubicHermiteSpline(double[] xInitialControlVector, double xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector)</pre>				
Implemented Documented Not WPILIB	Mer Exe Tes San	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
POSE WITH CURVATURE X X	X SI	PoseWithCurve_New.vi	public PoseWithCurvature(Pose2d poseMeters, double				
			curvatureRadPerMeter) public PoseWithCurvature()	can use cluster constant			
			public PoseWithGulvature() public Pose2d poseMeters	not needed, use cluster unpack	+		
							1
			public double curvatureRadPerMeter	not needed, use cluster unpack	+		

SPLINE PARAMETERIZER X

FRC LabVIEW Trajectory Library - VI Implementation List Revision 2.X 11/06/2022 – added various routines Execution Optimized Routine Venu Item Function Prototype Notes QUINTIC HERMITE SPLINE private SimpleMatrix getControlVectorFromArrays(double[] QuinticHermiteSpline getControlVectorFromArrays.vi initialVector, double[] finalVector) QuinticHermiteSpline makeHermiteBasis.vi private SimpleMatrix makeHermiteBasis() X X X public QuinticHermiteSpline(double[] xInitialControlVector, QuinticHermiteSpline_New.vi double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector)
protected SimpleMatrix getCoefficients() not needed, use cluster unpack Routine ltem Function Prototype Notes SPLINE (Abstract class) X X Spline_getPoint.vi public PoseWithCurvature getPoint(double t) Spline(int degree) public static class ControlVector public ControlVector(double[] x, double[] y) implemented as data structure Execution Optii Test Routine Function Prototype SPLINE HELPER SplineHelp GetCubicCtrlVector.vi private static Spline.ControlVector getCubicControlVector(double scalar, Pose2d point)
public static Spline.ControlVector[] SplineHelp GetCubicCtrlVectorsFromWayPts.vi Χ getCubicControlVectorsFromWaypoints(Pose2d start, Translation2d[] interiorWaypoints, Pose2d end) SplineHelp_GetCubicCtrlVectorsFromWeightedWayPts.vi Χ X X X X X No SplineHelp GetCubicSpline Calc1.vi internal Χ X X No SplineHelp GetCubicSpline Calc2.vi internal X X X No SplineHelp GetCubicSpline Calc3.vi internal X X Χ SplineHelp getCubicSplinesFromControlVectors.vi public static CubicHermiteSpline[] getCubicSplinesFromControlVectors(Spline.ControlVector start, Translation2d[] waypoints, Spline.ControlVector end) X SI SplineHelp_GetQuinticCtrlVector.vi XX private static Spline ControlVector getQuinticControlVector(double scalar, Pose2d point) public static List<Spline.ControlVector> SplineHelp_GetQuinticCtrlVectorsFromWayPts.vi REMOVED 2762 getQuinticControlVectorsFromWaypoints(List<Pose2d> waypoints) SplineHelp_GetQuinticCtrlVectorsFromWeightedWayPts.vi REMOVED 2762 SplineHelp getQuinticSplinesFromControlVectors.vi public static QuinticHermiteSpline[] getQuinticSplinesFromControlVectors(Spline.ControlVector[] controlVectors) SplineHelp GetQuinticSplinesFromWeightedWayPts.vi X $X \mid X \mid X$ New 2762 X SplineHelp GetQuinticSplinesFromWayPts.vi X Χ New 2762 Χ No SplineHelp ThomasAlgorithm.vi private static void thomasAlgorithm(double[] a, double[] b, double[] internal c, double[] d, double[] solutionVector) Execution Optimized Sample Program Routine Not WPILIB Menu Item

double t0, double t1)

SplineParam Spline T0 T1.vi

public static List<PoseWithCurvature> parameterize(Spline spline,

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

X	X		X	Χ	SplineParam_Spline.vi	public static List <posewithcurvature> parameterize(Spline spline)</posewithcurvature>		
X	Χ	XΛ	Vo		SplineParam_StackGet.vi		internal	
X	Χ	ΧΛ	Vo		SplineParam_StackPop.vi		internal	
X	X	XΛ	Vo		SplineParam StackPush.vi		internal	

public List<TrajectoryConstraint> getConstraints()

public double getEndVelocity()

Implemented differently, can't

can use cluster unpack

duplicate.

'----**TRAJECTORY** '======== Vot WPILIB Routin Menu Item Function Prototype Notes TRAJECTORY X X Χ Trajectory_Concatenate.vi Χ X Χ Trajectory_equals.vi boolean equals(other obj) **FUTURE** XX X SI Trajectory GetStates.vi public List<State> getStates() not needed, use unpack $X \mid X$ X SI Trajectory GetTotalTime.vi public double getTotalTimeSeconds() not needed, use unpack X X No SI Trajectory_lerp_double.vi private static double lerp(double startValue, double endValue, double t) No SI X X Trajectory_lerp_Pose.vi private static Pose2d lerp(Pose2d startValue, Pose2d endValue, internal double t) Χ X SI Trajectory_New_Empty.vi X X X X SI Trajectory_New.vi public Trajectory(final List<State> states) X Χ Χ Trajectory_RelativeTo.vi public Trajectory relativeTo(Pose2d pose) X X Trajectory Sample.vi public State sample(double timeSeconds) X Χ Χ Trajectory SampleReverse.vi Sample in reverse order. Negate XX Trajectory_TransformBy.vi public Trajectory transformBy(Transform2d transform) X public Pose2d getInitialPose() can use cluster unpack, array index Execution Optimized Menu Item Notes Function Prototype TRAJECTORY_STATE X X X SI TrajectoryState_Equals.vi boolean equals(other obj) XX X X SI TrajectoryState GetAll.vi XX X SI TrajectoryState GetPose.vi X TrajectoryState Interpolate.vi State interpolate(State endValue, double i) X X X public State(double timeSeconds, double Χ SI TrajectoryState_New.vi Χ velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State() Execution Optimized Not WPILIB Menu Item Function Prototype Notes Implemented differently, can't TRAJECTORY CONFIG X TrajectoryConfig_AddConstraint.vi public TrajectoryConfig addConstraint(TrajectoryConstraint X duplicate. X TrajectoryConfig_AddConstraints.vi public TrajectoryConfig addConstraints(List<? extends Implemented differently, can't X TrajectoryConstraint> constraints) XX X SI TrajectoryConfig Create.vi public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq) TrajectoryConfig_GetCentripetalAccel.vi X X

X

X

X

Χ

Χ

XX

TrajectoryConfig GetConstraints.vi

TrajectoryConfig_GetEndVelocity.vi

X	X		X		TrajectoryConfig_GetKinematicsDiffDrive.vi			
X	X		Χ		TrajectoryConfig_GetKinematicsMecanumfDrive.vi			
X	X		Χ		TrajectoryConfig_GetKinematicsSwerveDrive.vi			
X	X	X	Χ		TrajectoryConfig_GetMaxVelAccel.vi			
X	X		Χ		TrajectoryConfig_GetStartVelocity.vi	public double getStartVelocity()	can use cluster unpack	
X	X		Χ		TrajectoryConfig GetVoltageDiffDrive.vi			
X	X		Χ		TrajectoryConfig_IsReversed.vi	public boolean isReversed()	can use cluster unpack	
X	X	X	Χ	SI	TrajectoryConfig_setCentripetalAccel.vi	· ·		
X	X		Χ		TrajectoryConfig SetEndVelocity.vi	public TrajectoryConfig setEndVelocity(double		
						endVelocityMetersPerSecond)		
X	X		X	SI	TrajectoryConfig_setKinematicsDiffDrive.vi	public TrajectoryConfig setKinematics(DifferentialDriveKinematics		
						kinematics)		
X	X		X	SI	TrajectoryConfig_setKinematicsMecanumfDrive.vi	public TrajectoryConfig setKinematics(MecanumDriveKinematics		
						kinematics)		
X	X		X	SI	TrajectoryConfig_setKinematicsSwerveDrive.vi	public TrajectoryConfig setKinematics(SwerveDriveKinematics		
						kinematics)		
X	X		X	SI	TrajectoryConfig_setReversed.vi	public TrajectoryConfig setReversed(boolean reversed)		
X	X		Χ		TrajectoryConfig_SetStartVelocity.vi	public TrajectoryConfig setStartVelocity(double		
						startVelocityMetersPerSecond)		
X	X	X	Χ	SI	TrajectoryConfig_setVoltageDiffDrive.vi	· ·		
						public double getMaxVelocity()	Created function to return both	
						public double getMaxAcceleration()	Created function to return both	

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

								SPECIFIC AND NOT GENERIC.				
Implemented	Documented	Not WPILIB			Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
TRAJECTORY GENERATE X	X		X	(TrajectoryGenerate_Make_Cubic_CtrlVect.vi	public static Trajectory generateTrajectory(Spline.ControlVector initial, List <translation2d> interiorWaypoints, Spline.ControlVecto end, TrajectoryConfig config)</translation2d>	uses cubic splines			
X	X		Х	(TrajectoryGenerate_Make_Cubic.vi	end, TrajectoryConfig config) public static Trajectory generateTrajectory(Pose2d start, List <translation2d> interiorWaypoints, Pose2d end, TrajectoryConfig config)</translation2d>	uses cubic splines			
X	X	X	' X	(TrajectoryGenerate Make Generic.vi	TrajectoryConfig config) Helper to bring these all together	Use this one!!!			
X	Х		X	(TrajectoryGenerate_Make_Quintic_CtrlVect.vi	public static Trajectory generateTrajectory(ControlVectorList controlVectors, TrajectoryConfig config)	uses quintic splines			
X	X	X	´ X	(TrajectoryGenerate_Make_Quintic_Weighted.vi	, , , , , , , , , , , , , , , , , , ,	New 2762			
X	X		X	(TrajectoryGenerate_Make_Quintic.vi	<pre>public static Trajectory generateTrajectory(List<pose2d> waypoints, TrajectoryConfig config)</pose2d></pre>	uses quintic splines			
X	X		X	(TrajectoryGenerate_splinePointsFromSplines.vi	public static List <posewithcurvature> splinePointsFromSplines(Spline[] splines)</posewithcurvature>				
mplemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program				Code Review	Fest Program	Error Checking
	٥	_ >	: ≥	Щ	F	Ŋ	VI Name	Function Prototype	Notes	<u> </u>	<u> </u>	Ш
TRAJECTORY GENERATE (Control Vector)								public ControlVectorList(int initialCapacity) public ControlVectorList()	may not need, just data may not need, just data			
								public ControlVectorList() public ControlVectorList(Collection extends Spline.ControlVector collection)	may not need, just data			
nplemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program				Code Review	Test Program	Error Checking
∍Jdu	ŏ	Q.	9	.×̈	.O	œ.	VI Nama	Function Prototype	Notes	Ņ	.oo	<u>, -</u>
TRAJECTORY PARAMETERIZE X							VI Name TrajectoryParam_calcStuffFwd.vi	Function Prototype	Notes			Ev

TRAJECTORY PARAMETERIZE CONSTRUCTION STATE	Revision 2.X 11/06/2022 – added various routines		,	, .									
## 14 A				X	No			TrajectoryParam_calcStuffRev.vi			-		
TRAJECTORY PARAMETERIS CONSTRAINED STATE X X X X X X X X X		X	X		No			TrajectoryParam_enforceAccel.vi	private static void enforceAccelerationLimits(boolean reverse,	This routines needs to be changed			
TRAJECTORY UTIL X X X X X X X X X X X X X X X X X X X		X	X	X	No			TrajectoryParam enforceVelocity.vi	List< rrajectoryConstraint> constraints, ConstrainedState state)	This routines needs to be changed			
TRAJECTORY PARAMETERIZE CONSTRAINED STATE TRAJECTORY PARAMETERIZE CONSTRAINED STATE TRAJECTORY PARAMETERIZE CONSTRAINED STATE TRAJECTORY UNIT TRAJECTORY UN										when new constraints are added.			
TRAJECTORY PARAMETERIZE CONSTRAINED STATE V		X	X		X			TrajectoryParam_timeParam.vi	timeParameterizeTrajectory(List <posewithcurvature> points. List<trajectoryconstraint> constraints, double startVelocityMetersPerSecond, double</trajectoryconstraint></posewithcurvature>				
TRAJECTORY PARAMETERIZE CONSTRAINED STATE V						þ							
TRAJECTORY UTL	TRAJECTORY PARAMETERIZE CONSTRAINED STATE			Not WPILIB	Menu	Execution Optimize	Test Routine Samble Program		Function Prototype ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSd. double	Notes	Code Review	Test Program	Error Checking
X									maxAccelerationMetersPerSecondSq)				
X			X	X	X				"				
TRAJECTORY UTIL TRAJEC			X	X									
TRAJECTORY UTIL Trajectory UTIL X X X X X X X X X X													
TRAJECTORY UTIL X X X X X X X Trajectory Utilized Fundamental Son vi public static Trajectory traje			٨	^	^			Constrained State_Servelocity.vi	ConstrainedState()				
TRAJECTORY UTIL X X X X X X X X Tiglectory/Ull MakeWeightedWayPoint (ENG vi X X X X X X X X Tiglectory/Ull MakeWeightedWayPoint (ENG vi X X X X X X X X X Tiglectory/Ull MakeWeightedWayPoint (ENG vi X X X X X X X X X Tiglectory/Ull JoPath/Weaver/SON.vi public static Volt oPathweaver/son(Trajectory Vajectory, Path path) public static String senalize Trajectory (String json) public static String senalize Trajectory (Trajectory vajectory) TRAPEZOID PROFILE X X X X X Tigle-Tool (Calculate vi X X X X X X X Tigle-Tool (Calculate vi X X X X X X X X Tigle-Tool (Calculate vi X X X X X X X X X Tigle-Tool (Calculate vi X X X X X X X X X Tigle-Tool (Calculate vi X X X X X X X X Tigle-Tool (Calculate vi X X X X X X X X Tigle-Tool (Calculate vi X X X X X X X X Tigle-Tool (Calculate vi X X X X X X X X Tigle-Tool (Calculate vi X X X X X X X X Tigle-Tool (Calculate vi X X X X X X X X Tigle-Tool (Calculate vi X X X X X X X X Tigle-Tool (Calculate vi X X X X X X X X Tigle-Tool (Calculate vi X X X X X X X X Tigle-Tool (Calculate vi X X X X X X X X Tigle-Tool (Calculate vi X X X X X X X X X Tigle-Tool (Calculate vi X X X X X X X X X X Tigle-Tool (Calculate vi X X X X X X X X X X X X Tigle-Tool (Calculate vi X X X X X X X X		`							Constrained State()				
X X X X X X X I TrajectoryUtil MakeWeightedWayPoint ENG vi Trajectory Util MakeWeightedWayPoint Vi public static void toPathweaverJson(Trajectory trajectory, Path path) X X X X X X I TrajectoryUtil_IoPathWeaverJSON vi public static void toPathweaverJson(Trajectory trajectory, Path path) public static Trajectory deserialize Trajectory(String json) public static String serialize Trajectory (Trajectory trajectory) TRAPEZOID PROFILE X X X X X I TrapProfile Point vi Private, remove from menu TRAPEZOID PROFILE X X X X X I TrapProfile Direct vi Private, remove from menu X X X X X X X I TrapProfile Secure AlGoal vi TrapProfile Secure AlGoal vi TrapProfile Secure AlGoal vi X X X X X X X I TrapProfile Secure Point Vi		Ш		Not WPILIB	Menu	Execution O	Test Routine Sample Proc			Notes	Code Revier	Test Prograi	Error Check
TRAPEZOID PROFILE X	TRAJECTORY UTIL				X	_		TrajectoryUtil_fromPathWeaverJSON.vi	public static Trajectory fromPathweaverJson(Path path)				
TRAPEZOID PROFILE TRAPEZOID PROFILE TRAPEZOID PROFILE X X X X X X X X X X X X X X X X X X X					X	X							
Description				7		<i>X</i>		TrajectoryUtil_toPathWeaverJSON.vi	path)				
TRAPEZOID PROFILE													
TRAPEZOID PROFILE									public static String serialize Frajectory(Trajectory trajectory)				
X X X TrapProfile_Calculate.vi Private, remove from menu X X No TrapProfile_Direct.vi Private, remove from menu X		Implemented		Not WPILIB	Menu	Execution Optimized	Test Routine 		Function Prototype	Notes			
X X No TrapProfile_Direct.vi Private, remove from menu X<	TRAPEZOID PROFILE						\perp						
X X			X				+			Private remove from monu			
X X			X	X			_			i iivale, remove iioiii filefiu			
X X X X TrapProfile IsFinished.vi X X X X X TrapProfile New.vi X X X X X TrapProfile New.vi X X No TrapProfile ShouldFlipAcceleration.vi Private, remove from menu X X X TrapProfile TimeLeftUntil.vi X X X TrapProfile TotalTime.vi X X X TrapProfState Equals.vi						SI	+						
X X X X TrapProfile New_Definitial.vi X X X X X TrapProfile New.vi X X No TrapProfile_ShouldFlipAcceleration.vi Private, remove from menu X X X X TrapProfile_TimeLeftUntil.vi X X X TrapProfile_TotalTime.vi X X X TrapProfState_Equals.vi				'		_							
X X		X	X		X			TrapProfile_New_DefInitial.vi					
X X X TrapProfile TimeLeftUntil.vi X X X X TrapProfile TotalTime.vi X X X X X		X	X		X			TrapProfile_New.vi					
X X X TrapProfile_TotalTime.vi X X X X X										Private, remove from menu			
X X X TrapProfState_Equals.vi			X										
X X I I I I I TAPP TOI SI ATE_NEW.VI							+						
		X	X		X			TrapProfState_New.VI					

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TRAJECTORY CONSTRAINT

FRC_LabVIEW_Trajectory_Library_Routines.xlsx Page 19 / 39

Revision 2.X 11/06/2022 – added various routines	on 2.X 11/06/2	022 – added va	arious routines
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X 11/06/2022 – added various routines ====									
CENTRIPETAL ACCELERATION CONSTRAINT	X	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine	VI Name CentripetalAccelConstraint_getMaxVelocity.vi CentripetalAccelConstraint_getMinMaxAccel.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	Notes
	X	X		X	SI		CentripetalAccelConstraint_New.vi	public CentripetalAccelerationConstraint(double maxCentripetalAccelerationMetersPerSecondSq)	Can use cluster pack for no
DIFF DRIVE KINEMATIC CONSTRAINT	X Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine	VI Name DiffDriveKinematicsConstraint_getMaxVelocity.vi DiffDriveKinematicsConstraint_getMinMaxAccel.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax	Notes
	X	X		X	SI		DiffDriveKinematicsConstraint_New.vi	getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public DifferentialDriveKinematicsConstraint(final DifferentialDriveKinematics kinematics, double maxSpeedMetersPerSecond)	
DIFF DRIVE VOLTAGE CONSTRAINT	X Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine	VI Name DiffDriveVoltageConstraint_getMaxVelocity.vi DiffDriveVoltageConstraint_getMinMaxAccel.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters,	Notes
	X	X		X	SI		DiffDriveVoltageConstraint_New.vi	double curvatureRadPerMeter, double velocityMetersPerSecond) public DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	
ELLIPTICAL REGION CONSTRAINT	X X Implemented	X X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine	VI Name EllipRegionConstraint_getMaxVelocity.vi EllipRegionConstraint_getMinMaxAccel.vi	Function Prototype	Notes

FRC_LabVIEW_Trajectory_Library_Routines.xlsx

FRC LabVIEW Trajectory Library - VI Implementation List Revision 2.X 11/06/2022 – added various routines Function Prototype Notes JerkConstraint_getMaxVelocity.vi JerkConstraint_getMinMaxAccel.vi Routine exists, it is just a shell Routine exists, it is just a shell JERK CONSTRAINT **FUTURE** FUTURE SI JerkConstraint_New.vi Χ Routine exists, it is just a shell **FUTURE** Function Prototype Notes X MAX VELOCITY CONSTRAINT MaxVelocityConstraint_getMaxVelocity.vi Χ Χ SI X SI XX MaxVelocityConstraint_getMinMaxAccel.vi XX MaxVelocityConstraint New.vi X SI Function Prototype Notes MECANUM DRIVE KINEMATICS CONSTRAINT X X MecaDriveKinematicsConstraint_getMaxVelocity.vi X X X X X MecaDriveKinematicsConstraint getMinMaxAccel.vi Χ X SI MecaDriveKinematicsConstraint_New.vi Function Prototype Notes RECTANGULAR REGION CONSTRAINT X RectRegionConstraint_getRectRegion.vi Χ Χ X X X X X X X X X RectRegionConstraint_getMinMaxAccel.vi
RectRegionConstraint_lsPoseInRegion.vi
RectRegionConstraint_New.vi X X

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

FRC_LabVIEW_Trajectory_Library_Routines.xlsx Page 21 / 39

Function Prototype Notes TrajConstraint_GetMaxVelocity.vi
TrajConstraint_GetMinMaxAccel.vi TrajConstraint_GetType.vi

X SI TRAJECTORY CONSTRAINT (Min Max) X X

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X SI

Function Prototype Notes Constraint MinMax New.vi Constraint_MinMax_New Constraint MinMax NewMinMax.VI Constraint MinMax New

'========= UTILITY

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

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

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CONVERSIONS

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

FRC_LabVIEW_Trajectory_Library_Routines.xlsx Page 22 / 39

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
CONV	Χ	Χ	Χ	Χ	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	Χ	SI			Conv_GyroDegrees_Heading.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Heading_AngleRadians.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Inches_Meters.vi		
	Χ	Χ	X	Χ	SI			Conv_Kilograms_Pounds.vi		
	Χ	Χ	X	Χ	SI			Conv_Meters_Feet.vi		
	Χ	Χ	X	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		
	Χ	Χ	Χ	Χ	SI			Conv_Radians_Deg.vi		
	Χ	Χ	X	Χ	SI			Conv_Radians_Rotations.vi		
	X	X	X	Χ	SI			Conv_Rotations_Deg.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Rotations_Radians.vi		
	X	Χ	X	Χ	SI			Conv_Yards_Meters.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimi	Test Routine	Sample Program	VI Name	Function Prototype	Notes
UNITS	Χ	Χ		Χ	SI			Units_DegreesToRadians.vi		
	Χ	Χ		Χ	SI			Units_DegreesToRotations.vi		
	Χ	Χ		Χ	SI			Units_FeetToMeters.vi		
	X	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	Χ		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		X	SI			Units SecondsToMilliseconds.vi		

'======== PATHFINDER UTIL

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

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

XXXXX PathfinderUtil_ToTrajectoryStates.vi

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

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	Implemented	Documented	Not WPILIB	Menu Item	Execution	Test Routine	Name NI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DC MOTOR	X	Χ		Χ	SI		DCMotor_GetAndymark9015.vi					
	X	Χ		Χ	SI		DCMotor_GetAndymarkRs775_125.vi					
	X	Χ		Χ	SI		DCMotor_GetBag.vi					
	X	Χ		Χ	SI		DCMotor_GetBanebotsRs550.vi					
	X	Χ		Χ	SI		DCMotor_GetBanebotsRs775.vi					
	X	Χ		Χ	SI		DCMotor_GetCIM.vi					
	X	Χ		Χ	SI		DCMotor_GetCurrent.vi					
	X	Χ		Χ	SI		DCMotor_GetFalcon500.vi					
	X	Χ		Χ	SI		DCMotor_GetMiniCIM.vi					
	X	Χ		Χ	SI		DCMotor_GetNEO.vi					
	X	Χ		Χ	SI		DCMotor_GetNEO550.vi					
	X	Χ		Χ	SI		DCMotor_GetRomiBuiltIn.vi					
	X	Χ		Χ	SI		DCMotor_GetVex775Pro.vi					
	X	Χ		Χ	SI		DCMotor_New.vi					
	X	Χ		Χ	SI		DCMotor_PickMotor.vi					

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

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

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

X 11/06/2022 – added various routines									
	XX	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	(DiffDrivePoseEst_Update.vi			
	X X					DiffDrivePoseEst_UpdateWithTime.vi			
	XX		(DiffDrivePoseEst_VisionCorrect_Callback.vi			
	$X \mid X$	λ	(DiffDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi			
EXTENDED KALMAN FILTER	X X X X X X X X X X X X X X X X X X X	Not WPILIB		Execution Optimized Test Routine	Sample Program		Code Review	Test Program	Error Checking
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					_	ExtendedKalmanFilter_SetXHat_Single.vi ExtendedKalmanFilter_SetXHat.vi			
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KALMAN FILTER	XX	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		Execution X Test Routi	Sample	VI Name Function Prototype Notes KalmanFilter_Correct.vi	Code Rev	Test Prog	ģ
KALMAN FILTER)))))))		Exec Test	Sample	VI Name Function Prototype Notes	Code Rev	Test Prog	Ď
KALMAN FILTER	X	Not WPILIB		X X X X Z Z Z Z	am	VI Name Function Prototype Notes KalmanFilter_Correct.vi KalmanFilter_GetK Single.vi KalmanFilter_GetK Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat Single KalmanFilter_Predict.vi KalmanFilter_Predict.vi KalmanFilter_Seset.vi KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat_Single VI Name Function Prototype Notes KalmanFilter_LatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.vi KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_New.vi KalmanFilterLatencyComp_Dobserver, New.vi	Code Review	Test Program	Ď
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	X			X				MecaDrivePoseEst_AddVisionMeasurement.vi MecaDrivePoseEst GetEstimatedPosition.vi					
	X	X		No				MecaDrivePoseEst_GetEstimatedPosition.vi MecaDrivePoseEst Kalman F Callback.vi					
	X	X		No				MecaDrivePoseEst_Kalman_H_Callback.vi					
		X		X				MecaDrivePoseEst New.vi					
		X		X				MecaDrivePoseEst_ResetPosition.vi					
	X	Χ		X				MecaDrivePoseEst SetVisionMeasurementStdDevs.vi					
		Χ		Χ				MecaDrivePoseEst_Update.vi					
		Χ		X				MecaDrivePoseEst_UpdateWithTime.vi					
	X	Χ		No				MecaDrivePoseEst_VisionCorrect_Callback.vi					
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SWERVE DRIVE POSE ESTIMATOR								SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi					
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		Χ		X				SwerveDrivePoseEst_Kalman_F_Callback.vi					
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		X		X				SwerveDrivePoseEst_ResetPosition.vi SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi					
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		X		X				SwerveDrivePoseEst_OpdateWithTime.vi					
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UNSCENTED KALMAN FILTER		X		X				UnscentedKalmanFilter Correct FuncGroup.vi					
		X		X				UnscentedKalmanFilter_Correct_OnlyUY.vi					
		Χ		Х				UnscentedKalmanFilter_Correct_OnlyUYR.vi					
	X	Χ		X				UnscentedKalmanFilter Correct.vi					
	X	Χ		X				UnscentedKalmanFilter_GetP_Single.vi					
		Χ		X				UnscentedKalmanFilter_GetP.vi					
		Χ		Χ				UnscentedKalmanFilter_GetXHat_Single.vi					
	X	Χ		Χ				UnscentedKalmanFilter_GetXHat.vi					
	X	Χ		Χ				UnscentedKalmanFilter_New_Default.vi					
		Χ		Χ				UnscentedKalmanFilter_New_FuncGroup.vi					
		Χ		X				UnscentedKalmanFilter_New.vi					
		X		X				UnscentedKalmanFilter_Predict.vi					
		X		X				UnscentedKalmanFilter_Reset.vi					
		X		X				UnscentedKalmanFilter_SetP.vi					
	X	X		X				UnscentedKalmanFilter_SetXHat_Single.vi					
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DIFFERENTIAL DRIVE ACCELERATION LIMITER		Χ		Χ	X		DiffDrvAccelLimit_Calculate.vi					
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	X	X		X X	X		ImplModelFollow_New.vi					
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	X	X X		X X X	X X X		ImplModelFollow_New.vi ImplModelFollow_New_Plant.vi					
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X X X	LinearQuadraticRegulator_GetU.vi				
X X X X		Routine e	exists, but it only has		
			aise matrix to power.		
X X X	LinearQuadraticRegulator_New_ELMS.vi				
X X X	LinearQuadraticRegulator_New_N.vi				
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	LinearQuadraticRegulator_New_SystemELMS.vi LinearQuadraticRegulator_New.vi				
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		Function Prototype Notes	Code	Test	Error
LINEAR SYSTEM X X X	LinearSystem_CalculateX.vi				
X X X I	LinearSystem_CalculateY.vi				
X X X SI	LinearSystem_GetA.vi				
X X X SI	LinearSystem_GetAElement.vi				
X X X SI	LinearSystem_GetB.vi				
X X X SI	LinearSystem_GetBElement.vi				
X X X SI	LinearSystem_GetC.vi LinearSystem_GetCElement.vi				
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Continue	LinearSystemLoop_ClampInput.vi LinearSystemLoop_Correct.vi LinearSystemLoop_GetClampFunction.vi LinearSystemLoop_GetController.vi LinearSystemLoop_GetError_Single.vi	Function Prototype Notes	Code Revi	Test Prog	Error Cl
LINEAR SYSTEM LOOP	LinearSystemLoop_ClampInput.vi LinearSystemLoop_Correct.vi LinearSystemLoop_GetClampFunction.vi LinearSystemLoop_GetController.vi LinearSystemLoop_GetError_Single.vi LinearSystemLoop_GetError.vi	Function Prototype Notes	Code Revi	Test Prog	Error Cf
LINEAR SYSTEM LOOP	LinearSystemLoop_ClampInput.vi LinearSystemLoop_Correct.vi LinearSystemLoop_GetClampFunction.vi LinearSystemLoop_GetController.vi LinearSystemLoop_GetError_Single.vi LinearSystemLoop_GetError.vi LinearSystemLoop_GetFeedForward.vi	Function Prototype Notes	Code Revi	Test Prog	Error Cl
LINEAR SYSTEM LOOP	LinearSystemLoop_ClampInput.vi LinearSystemLoop_Correct.vi LinearSystemLoop_GetClampFunction.vi LinearSystemLoop_GetController.vi LinearSystemLoop_GetError_Single.vi LinearSystemLoop_GetError.vi LinearSystemLoop_GetFeedForward.vi LinearSystemLoop_GetNextR_Single.vi	Function Prototype Notes	Code Revi	Test Prog	Error Cl
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LINEAR SYSTEM LOOP	LinearSystemLoop_ClampInput.vi LinearSystemLoop_Correct.vi LinearSystemLoop_GetClampFunction.vi LinearSystemLoop_GetController.vi LinearSystemLoop_GetError_Single.vi LinearSystemLoop_GetError.vi LinearSystemLoop_GetFeedForward.vi LinearSystemLoop_GetNextR_Single.vi LinearSystemLoop_GetNextR.vi LinearSystemLoop_GetObserver.vi	Function Prototype Notes	Code Revi	Test Prog	Error Cl
LINEAR SYSTEM LOOP	LinearSystemLoop_ClampInput.vi LinearSystemLoop_Correct.vi LinearSystemLoop_GetClampFunction.vi LinearSystemLoop_GetController.vi LinearSystemLoop_GetError_Single.vi LinearSystemLoop_GetError.vi LinearSystemLoop_GetFeedForward.vi LinearSystemLoop_GetNextR_Single.vi LinearSystemLoop_GetNextR.vi LinearSystemLoop_GetObserver.vi LinearSystemLoop_GetObserver.vi LinearSystemLoop_GetU_Row.vi	Function Prototype Notes	Code Revi	Test Prog	Error Cf
LINEAR SYSTEM LOOP	LinearSystemLoop_ClampInput.vi LinearSystemLoop_Correct.vi LinearSystemLoop_GetClampFunction.vi LinearSystemLoop_GetController.vi LinearSystemLoop_GetError_Single.vi LinearSystemLoop_GetError.vi LinearSystemLoop_GetFeedForward.vi LinearSystemLoop_GetNextR_Single.vi LinearSystemLoop_GetNextR.vi LinearSystemLoop_GetObserver.vi	Function Prototype Notes	Code Revi	Test Prog	Error Cl

X	Χ	X		LinearSystemLoop_GetXHat.vi		
				LinearSystemLoop_New_BBB		
				LinearSystemLoop_New_LinearSystem_ClampFunc		
X	Χ	X		LinearSystemLoop_New_LinearSystem_ClampVal.vi		
X	Χ	X		LinearSystemLoop_New.vi		
X	X	X		LinearSystemLoop_Predict.vi		
X	X	X		LinearSystemLoop_Reset.vi		
				LinearSystemLoop_SetClampFunction.vi		
				LinearSystemLoop_SetNextR_Some.vi		
X	X	X		LinearSystemLoop_SetNextR.vi		
				LinearSystemLoop_SetXHat_Single.vi		
				LinearSystemLoop_SetXHat.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
LTV DIFFERENTIAL DRIVE CONTROLLER	Χ	Χ		Χ			LTVDiffDriveCtrl_Calculate.vi					
	X	X		Χ			LTVDiffDriveCtrl_New.vi					
	X	X		Χ			LTVDiffDriveCtrl_Calculate_TrajState.vi					
	X	Χ		Χ			LTVDiffDriveCtrl_Calculate_SetTolerance.vi					
	Χ	Χ		Χ			LTVDiffDriveCtrl_Calculate_AtReference.vi					

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

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

> Function Prototype Notes CallbackHelp_MatrixMinus.vi
> CallbackHelp_MatrixMult_CoerceSizeB.vi
> CallbackHelp_MatrixMult.vi
> CallbackHelp_MatrixPlus.vi CALLBACK HELPER X X X X

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DISCRETIZATION	X	Χ		X		Χ	Discretization_DiscretizeA.vi					
	X	Χ		X		Χ	Discretization_DiscretizeAB.vi					
	Χ	Χ		X		Χ	Discretization_DiscretizeABTaylor.vi					
	Χ	Χ		X		Χ	Discretization_DiscretizeAQ.vi					
	Χ	Χ		X		Χ	Discretization_DiscretizeAQTaylor.vi					
	Χ	Χ		X			Discretization_DiscretizeR.vi					
					imized		am					6

Function Prototype Notes StateSpaceUtil_Check_Stabalizable.vi Internal routine X X X X X X X X StateSpaceUtil_ClampInputMaxMagnitude.vi
StateSpaceUtil_IsDetectable.vi Χ Routine exists, it is just a shell Χ StateSpaceUtil_IsStabalizable.vi Χ Χ StateSpaceUtil_MakeCostMatrix.vi Χ StateSpaceUtil_MakeCovarianceMatrix.vi Χ StateSpaceUtil_MakeWhiteNoiseVector.vi
StateSpaceUtil_NomalizeInputVector.vi Χ X StateSpaceUtil_PoseTo3dVector.vi Χ StateSpaceUtil_PoseTo4dVector.vi XX Χ StateSpaceUtil_PoseToVector.vi

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program IN amel In a second se		Function Prototype	Notes	Code Review	Test Program	Error Checking
BATTERY SIM	X	X		Χ	SI		BatterySi	m_CalculateDefaultBatteryLoadedVoltage.vi					
	X	Χ		Χ	SI		BatterySi	m_CalculateLoadedVoltage.vi					

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

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

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

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FLYWHEEL SIM		Χ		Χ				FlyWheelSim_GetAngularVelocityRadPerSec.vi					
	X	Χ		Χ				FlyWheelSim_GetAngularVelocityRPM.vi					
	Χ	Χ		Χ				FlyWheelSim_GetCurrentDrawAmps					
								FlyWheelSim_New_LinSys		Future			
								FlyWheelSim_New_LinSys_MOI_NoNoise		Future			
								FlyWheelSim_New_LinSys_NoNoise		Future			
	X	Χ		Χ				FlyWheelSim_New_MOI.vi					
	Χ	Χ		Χ				FlyWheelSim_SetInput.vi					
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LINEAR SYSTEM SIM	Χ	Χ		Χ				LinearSystemSim ClampInput.vi	,				
								LinearSystemSim_GetCurrentDrawAmps.vi		DONT IMPLEMENT			
	Χ	Χ		Χ				LinearSystemSim_GetOutput_Single.vi					
	X	X		Χ				LinearSystemSim_GetOutput.vi					
	X	X		X				LinearSystemSim_New					
								LinearSystemSim_New_NoNoise.vi					
	Х	X		Χ				LinearSystemSim_SetInput_Array.vi		Doesn't use clamp ?			
	X	X		X				LinearSystemSim_SetInput_Single.vi		Doesii t use clamp :			
•								Linear System Sim_Settinput_Single.vi					
•	X	X		X				LinearSystemSim_SetInput.vi					
	X	X		X				LinearSystemSim_Setstate.vi					
	X	X		Χ				LinearSystemSim_Update.vi					
	X	Χ		No				LinearSystemSim_UpdateX.vi					
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SINGLE JOINT ARM SIM		Χ		Χ				SngJntArmSim_EsitmateMOI.vi					
	X	Χ		Χ				SngJntArmSim_GetAngleRads.vi					
	X	Χ		Χ				SngJntArmSim_GetCurrentDraw.vi					
	X	Χ		Χ				SngJntArmSim GetVelocityRadsPerSec.vi					
	Χ	X		Χ				SngJntArmSim_HasHitLowerLimit.vi					
		X		X				SngJntArmSim_HasHitUpperLimit.vi					
		X		X				SngJntArmSim_New.vi					
	X	X		No				SngJntArmSim_Rkf45_Func.vi					
	^	X		X									
								SngJntArmSim_SetInputVoltage.vi					
	X	X		X				SngJntArmSim_SetState.vi					
	X	X		Χ				SngJntArmSim_Update.vi					
		Χ		Χ				SngJntArmSim_UpdateX.vi					
		Χ		Χ				SngJntArmSim_WouldHitLowerLimit.vi					
	Χ	Χ		Χ				SngJntArmSim_WouldHitUpperLimit.vi					

FRC_LabVIEW_Trajectory_Library_Routines.xlsx Page 32 / 39

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MAT BUILDER	X X Implemented	X X Documented	Not WPILIB	X Menu Item	ed 9 Execution Optimized	Test Routine	N	VI Name MatBuilder_Create.vi MatBuilder_Fill.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
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_					<u></u>		N	Matrix_ChangeBoundsUnchecked.vi					
	Χ	X		X	SI			Matrix_Create.vi Matrix_Det.vi					
	X	X		X	SI			Matrix_Diag.vi					
								Matrix Div Scalar.vi		labview has function			
							N	Matrix_ElementPower.vi					
	Χ	Χ		X	SI			Matrix_ElementSum.vi					
								Matrix_ElementTimes.vi					
				\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	,			Matrix_Equals.vi					
	X	X		X	SI			Matrix_Exp.vi Matrix ExtractColumnVector.vi					
	X	X		X	SI			Matrix ExtractFrom.vi					
					0,			Matrix ExtractMatrix.vi					
	Χ	X		X	SI			Matrix ExtractRowVector.vi					
	X	Χ		Χ	SI		N	Matrix_Fill.vi					
								Matrix_Get.vi		labview has function			
	Χ	X		X	1			Matrix_Ident.vi		WPILIB calls this EYE			
								Matrix_Inv.vi					
	Χ	X		X	SI			Matrix_IsEqual.vi Matrix_IsIdentical.vi					
	X	X		X	1			Matrix_LLTDecompose.vi					
								Matrix Max.vi					
								Matrix_MaxAbs.vi					
							N	Matrix_Mean.vi					
								Matrix_MinInternal.vi					
								Matrix_Minus_Matrix.vi					
	Χ			X	1			Matrix_Minus_Scalar.vi Matrix_NormF.vi					
	^				<i>'</i>			Matrix NormIndP1.vi					
								Matrix Plus Matrix.vi					
								Matrix_Plus_Scalar.vi					
	Χ	Χ		X	1		N	Matrix_Pow.vi		THIS NEEDS WORK!!!!			
	Χ	Χ		X	SI			Matrix_SetColumn.vi					
	X	X		X	SI		N		THERE ARE LOTS OF OTHER MATRIX FUNCTIONS THAT SHOULD BE INCLUDED HERE FOR ISOLATION.				
							N	Matrix_Solve.vi	GITOGED BE INCEODED HEILE FOR TOOLS THOU				
							N	Matrix_Times_Matrix.vi					
								Matrix_Times_Scalar.vi					
								Matrix_Trace.vi					
-	X		V	X	SI			Matrix_Transpose.vi					
-	Χ	٨	Χ	X	-		I'	Matrix_WithinTolerance.vi					
L													

FRC_LabVIEW_Trajectory_Library_Routines.xlsx Page 33 / 39

### A PRINCIPLE NATION Principle Princ	· vi impiementation	LIST								_				
SIMPLE MATRIX X X X S Simple Mobile Edward Matrix Simple Mobile Simple Mobil	is routines													
## ATRIX HELPER X X X S				Not WPILIB	X Menu Item	Execution	Test Routine			Function Prototype	NOTE Matrix also has an ExtractMatrix with different calling	Code Review	Test Program	Error Checking
Section Prototype Notes Section Prototype														
MATRIX HELPER X				Not WPILIB	Menu Item	Execution	Test Routine			Function Prototype	Notes	Code Review	Test Program	Error Checking
VECTOR BUILDER X X X S Matrix-Helper Zero.vi	MATRIX HELPER				X	SI								
Notes Note		X	X	Χ	Χ	SI			MatrixHelper_MultCooerceBSize.vi					
VECTOR BUILDER		X	Χ	X	X	SI			MatrixHelper_Zero.vi					
	VECTOR BUILDER	R X	Χ	Not WPILIB	X	ଦ Execution	Test Routine		VecBuilder_1x1Fill.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
X		X			X	SI								
X		X			X	21								
X						SI								
X					X	SI								
						SI								
VecBuilder_10x1Fill.vi		X	X		X	SI								
VECTOR X X X X X St Vector Dot vi									VecBuilder_9x1Fill.vi					
VECTOR X X X X X St Vector Dot vi									VecBuilder_10x1Fill.vi					
VECTOR X X X S/ Vector Dot.vi		X	X	X	X	SI			VecBuilder_ArrayBy1Fill.vi					
VECTOR X X X SI Vector Dot.vi		Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
X X Si Vector_Norm.vi	VECTOR				X	SI			Vector Dot.vi	- unodon i fototypo	110100			F
		X	X		X	Si			Vector_Norm.vi					

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

FRC_LabVIEW_Trajectory_Library_Routines.xlsx Page 34 / 39

 added various routines 					~								
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	pə.	eq	В		opt	ue	Progr				ew.	am	kir
	eni	ent	7	Item	io	Routine	Ţ				Sev.	ıbo.	, hес
	lem	ш	¥	וחו	cut	t R	əJdι				e F	Ţ	Š
	Implemented	Documented	Not WPILIB	Menu	Execution	Test	Sample	VI Name	Function Prototype	Notes	Code	esi	Error Checking
ANGLE STATISTICS		X	X	X			T 0,	AngleStats_AngleAdd_CallbackHelp.vi	unotion i rototypo	110103			
ANGLEGIATION	X	X		X	1	X	+-	AngleStats_AngleAdd.vi					
	X	X	X				+	AngleStats_AngleMean_CallbackHelp.vi					
	X	Χ		X	1	X	T	AngleStats_AngleMean.vi					
	X	Χ	X	X	X			AngleStats_AngleResidual_CallbackHelp.vi					
	X	Χ		X	I	X		AngleStats_AngleResidual.vi					
					_								
					zec								
					iri		ат						Ø
	<i>p</i> ₆	Þ	m		Opt	je	ogr.				9	ш	Error Checking
	ente	ente	1	ltem		Routine	ď				ević)gra	Jec
	ш́е	ıme	Ϋ́	7	utic	8	a/a				Ř.	Pro	Ó
	'mplementea	Documentea	Not WPILIB	Menu	Execution	Test	Sample	10 N	- " B. ()	N	Code	est	5
MATHITUIT			_ <_	_ <u>></u>			<u>\</u>	VI Name	Function Prototype	Notes	<u> </u>		<u> </u>
MATH UTILITY	X	X		X	SI		+	MathUtil_AngleModulus.vi MathUtil_ApplyDeadband.vi					
	X	X		X			+	MathUtil_Clamp_Int.vi					
	X	\hat{X}		X	SI		+-	MathUtil_Clamp.vi					
	X	X		X	SI		+-	MathUtil_InputModulus.vi					
	X	X		X			+	MathUtil_Interpolate.vi					
			•			_						'	
					nized								
					niz		3						
	Ø	75			Optin	a)	gra				>	5	ing
	Je J	ıtec	-IB	3		ţi	Program				Vie	gra	Checking
	neı	ner	Į,	Item	tio	Sou	le F				Re	ž	Š
	'mplemented	Documentea	Not WPILIB	Menu	Execution	Test Routine	Sample				Code	st F	
	_		No		Ĕ	7e.	Sa	VI Name	Function Prototype	Notes	ပိ	7e.	Error
MERWE SCALED SIGMA POINTS		Χ		X	1		<u> </u>	MerweScSigPts_ComputeWeights.vi					
	X	Χ		X	SI		—	MerweScSigPts_GetNumSigmas.vi					
	X	X		X				MerweScSigPts_GetWc_Single.vi					
	X	X		X	SI		+	MerweScSigPts_GetWc.vi					
	X	X		X			+	MerweScSigPts_GetWm_Single.vi					
	X	X		X	SI		+	MerweScSigPts_GetWm.vi MerweScSigPts_New_Default.vi					
	X	X		\hat{x}	1	+	+-	MerweScSigPts_New.vi					
	X	X		$\frac{\lambda}{X}$	1		+-	MerweScSigPts_SigmaPoints.vi					
				<u> </u>	† <i>'</i>	1	+	gg					
					eq								
					niz		3						
	Ø	75			Optimized	a)	Prograi				>	5	ing
	ute.	ıtec	-IB	8	0	ţi	õ				viel	gra	eck 3ck
	ие	ner	Į,	lte.	tio	Sou	le F				R_{e}	Program	Č
	Implemented	Documented	Not WPILIB	Menu Item	n	Test Routine	Sample				Code Revie	st F	Error Checking
			8		Execution	7e	Sa		Function Prototype	Notes	ပိ	7e	Eu
NUMERICAL INTEGRATION	I X	X		X	1			NumIntegrate_Func_Ax_Bu_K.vi		NOT USED. Should this be used			
	_	~		X			+	NumIntegrate_Rk4_Dbl_X_U.vi		or abandoned???			
	X	X		X			+-	NumIntegrate_Rk4_Dbl_X_U.vi NumIntegrate_Rk4_Dbl_X.vi					
	X	^ Y		<u>^</u>			+-	NumIntegrate_Rk4_Dbl_X.vi NumIntegrate_Rk4_Mat_X_U.vi					
	X	X		X			+-	NumIntegrate_Rk4_Mat_X_0.vi					
	X	X		No	SI		+	NumIntegrate_Rkdp_Func_A.vi					
	X	X		No	SI		+	NumIntegrate_Rkdp_Func_B1.vi					
	X	Χ		No	SI		1	NumIntegrate_Rkdp_Func_B1B2.vi					
	X	Χ		No	SI		I	NumIntegrate_Rkdp_Func_B2.vi					
		Χ		No	1			Numintegrate_Rkdp_Impl.vi					

Mat_X_U.vi Func_A.vi Func_B1.vi Func_B182.vi Func_B2.vi Func_B2.vi Func_Cb.vi Func_Ch.vi Func_Ct.vi Func_Ct.vi Func_Ct.vi Removed. Replaced with newer functions.			
Func_B1.vi Func_B182.vi Func_B2.vi Func_Bs.vi Removed. Replaced with newer functions. Func_Ch.vi Removed. Replaced with newer functions. Func_Ct.vi Removed. Replaced with newer functions. Func_Ct.vi Removed. Replaced with newer functions. Mat_X_U.vi Note that this Feinberg method has been changed and a Dormand Price method has been			
Func_B1.vi Func_B182.vi Func_B2.vi Func_Bs.vi Removed. Replaced with newer functions. Func_Ch.vi Removed. Replaced with newer functions. Func_Ct.vi Removed. Replaced with newer functions. Func_Ct.vi Removed. Replaced with newer functions. Mat_X_U.vi Note that this Feinberg method has been changed and a Dormand Price method has been			
Func_B1B2.vi Func_Bs.vi Func_Ch.vi Func_Ct.vi mpl.vi Mat_X_U.vi Func_B1B2.vi Removed. Replaced with newer functions. Note that this Feinberg method has been changed and a Dormand Price method has been			
Func_B2.vi Func_Bs.vi Removed. Replaced with newer functions. Func_Ch.vi Removed. Replaced with newer functions. Func_Ct.vi Removed. Replaced with newer functions. Removed. Replaced with newer functions. Mat_X_U.vi Note that this Feinberg method has been changed and a Dormand Price method has been			
Func_Bs.vi Removed. Replaced with newer functions. Func_Ch.vi Removed. Replaced with newer functions. Func_Ct.vi Removed. Replaced with newer functions. Removed. Replaced with newer functions. Mat_X_U.vi Note that this Feinberg method has been changed and a Dormand Price method has been			
functions. Func_Ch.vi Removed. Replaced with newer functions. Func_Ct.vi Removed. Replaced with newer functions. mpl.vi Mat_X_U.vi Note that this Feinberg method has been changed and a Dormand Price method has been			
functions. Func_Ct.vi Removed. Replaced with newer functions. mpl.vi Mat_X_U.vi Note that this Feinberg method has been changed and a Dormand Price method has been			
Func_Ct.vi Removed. Replaced with newer functions. mpl.vi Mat_X_U.vi Note that this Feinberg method has been changed and a Dormand Price method has been			1
mpl.vi Mat_X_U.vi Note that this Feinberg method has been changed and a Dormand Price method has been		, ,	
Mat_X_U.vi Note that this Feinberg method has been changed and a Dormand Price method has been			
New.vi Removed. Never used.			
iv.lc		ļ	
at.vi			
			<u> </u>
Function Prototype Notes	Code Review	Test Program	Error Checking
ng_RK4_Mat_T_Y.vi			
Function Prototype Notes	Code Review	Test Program	Error Checking
		,	
Function Prototype Notes	Code Review	Test Program	Error Checking
		,	
Routine exists, it is just a shell			
Able.vi Routine exists, it is just a shell Not really done !!! e.vi Intended to allow DARE method			
Routine exists, it is just a shell Able.vi Able.vi Not really done !!! Intended to allow DARE method testing.			
Routine exists, it is just a shell Routine exists, it is just a shell Not really done !!! Intended to allow DARE method testing.			
Routine exists, it is just a shell Routine exists, it is just a shell Not really done !!! Intended to allow DARE method testing.		<u> </u>	1
Routine exists, it is just a shell Routine exists, it is just a shell Not really done !!! Intended to allow DARE method testing.			
Routine exists, it is just a shell Routine exists, it is just a shell Not really done !!! Intended to allow DARE method testing.			
	testing.	ate.vi	ate.vi testing.

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

- added various routines	
COMPUTER VISION UTILITIES X X X X X CompVisionUtil_CalculateDistanceToTarget.vi	Error Checking
X X X CompVisionUtil_EstimateCameraToTarget.vi	
X X X Compvisionotii_Estimaterield1oCamera.vi	
X X X CompVisionUtil_EstimateFieldToRobot.vi	
X X X CompVisionUtil_EstimateFieldToRobot_Alt.vi	

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

> Function Prototype Notes NETWORK UDP X X X NetworkUDP_Close.vi NetworkUDP_Receive.vi NetworkUDP_Send.vi

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

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

Z	Ζ	X	X	NA	DISPLAY_WEIGHTED_WAYPOINT.ctl	New V1.5. was
						UTIL_WEIGHTED_WAYPOINIT.VI
Z	Ζ	X	X	N/A	ELEV_FF.CTL	
Z	Z	X	X	N/A	ELEV_FF.CTL ELEVATOR SIM.CTL	
Z	Z	X	X	N/A	EXTENDED KALMAN CORRECT FUNC GROUP.CTL	
Z		\overline{X}	X	N/A	EXTENDED_KALMAN_FILTER.CTL	
Z	Z	X	X	N/A	FLYWHEEL SIM.ctl	
Z	Z	X	X	N/A	FUNCTION_GENERATOR.ctl	
Z	Z	X	X	N/A	FUNCTION GENERATOR MATRIX.ctl	
Z	Z	X	X	N/A	HOLONOMIC DRV CTRL.CTL	New 1/26/21
Z	Z	X	X	N/A	TIME INTERPOLATABLE BOOLEAN.CTL	170721
Z	Z	X	X	N/A	TIME INTERPOLATABLE DOUBLE.CTL	
Z	Z	X	X	N/A	TIME INTERPOLATABLE POSE2D.CTL	
Z	Z	X	X	N/A	TIME INTERPOLATABLE ROTATION2D.CTL	
Z	Z	X	X	N/A	KALMAN FILTER LATENCY COMP FUNC GROUP.CTL	
Z	Z	X	X	N/A	KALMAN FILTER LATENCY COMP.CTL	
Z	Ζ	Χ	X	N/A	KALMAN FILTER.cti	
Z	Ζ	X	X	N/A	LINEAR FILTER.CTL	
Z	Ζ	Χ	X	N/A	LINEAR PLANT INV FF.ctl	
Z	Ζ	Χ	X	N/A	LINEAR QUADRATIC REGULATOR.ctl	
Z	Ζ	Χ	Χ	N/A	LINEAR SYSTEM LOOP.ctl	
Z	Ζ	X	Χ	N/A	LINEAR_SYSTEM_SIM.ctl	
Z	Ζ	Χ	Χ	N/A	LINEAR SYSTEM.ctl	
Z	Ζ	Χ	X	N/A	LTV_DIFF_DRIVE_CTRL.ctl	
Z	Ζ	X	X	N/A	LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl	
Z	Ζ	Χ	X	N/A	LTV_UNICYCLE_CONTROLLER.CTL	
N/A		N/A		N/A	LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl	OBSOLETE – Removed
Z	Ζ	X	X	N/A	LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl	
Z	Ζ	X	X	N/A	MECA_DRIVE_KINEMATICS.CTL	
Z	Ζ	Χ	X	N/A	MECA_DRIVE_ODOMETRY.CTL	
Z	Ζ	Χ	X	N/A	MECA_DRIVE_POSE_EST.CTL	
Z	Ζ	Χ	X	N/A	MECA_WHEEL_POSITIONS.CTL	
Z	Ζ	Χ	X	N/A	MECA_WHEEL_SPEEDS.CTL	
Z	Ζ	Χ	X	N/A	MEDIAN_FILTER.CTL	
Z	Ζ	X	Χ	N/A	MERWE_SCALED_SIGMA_PTS.ctl	
Z	Z	X	X	N/A	OBSERVER_SNAP_LIST_ITEM.CTL	
Z	Z	X	X	N/A	OBSERVER_SNAPSHOT.CTL	
Z	Z	X	X	N/A	PARAM_STACK_ITEM.CTL	
Z	Z	X	X	N/A	PARAM_STACK.CTL	
Z	Z	X	X	N/A	PID_ADV_LIMITS.CTL	
Z	Z	X	X	N/A N/A	PID_ADV_TUNING.CTL PID_CONTROLLER.CTL	
Z Z	Z	X	X	N/A N/A	PID_CONTROLLER.CTL PID_ERROR_TOLERANCE.CTL	
Z	Z	X	X	N/A N/A	PID_ERROR_TOLERANCE:CTL PID_INPUT_LIMITS.CTL	
Z	Z		X	N/A	PID_INFO1_LIMITS.CTL	
Z	Z	X	X	N/A	POSE2D.CTL	
Z	Z	$\frac{\lambda}{X}$	X	N/A	POSE3D.CTL	
Z	Z	X	X	N/A	POSEWCURVATURE.CTL	
Z	Z	X	X	N/A	PROFILED_PID_CONTROLLER.CTL	
Z	Z	X	X	N/A	QUATERNION.CTL	
Z	Z	X	X	N/A	RAMSETE EXE TUNING.CTL	
Z	Z	X	X	N/A	RAMSETE.CTL	
Z	Z	X	X	N/A	ROTATION2D.CTL	
Z	Z	X	X	N/A	ROTATION3D.CTL	
Z	Z	X	X	N/A	SIMPLE MOTOR FF.CTL	
Z	Ζ	X		N/A	SIMPLE_MOTOR_FF_KA_TUNE_PARAMS.CTL	
Z	Ζ	X	Χ	N/A	SINGLE_JOINT_ARM_SIM.CTL	
Z	Ζ	X	Χ	N/A	SLEW_RATE_LIMITER.CTL	
Z	Ζ	X	Χ	N/A	SPLINE_CTRL_VECTOR.CTL	
Z	Ζ	Χ	Χ	N/A	SPLINE.CTL SPLINE.	
Z	Ζ	X	Χ	N/A	SWERVE_DRIVE_KINEMATICS.CTL	
Z	Ζ	X	Χ	N/A	SWERVE_DRIVE_MODULE_POSITION.CTL	
Z	Ζ	X	Χ	N/A	SWERVE_DRIVE_MODULE_STATE.CTL	
Z	Ζ	X	Χ	N/A	SWERVE_DRIVE_ODOMETRY.CTL	
Z	Ζ	X	Χ	N/A	SWERVE_DRIVE_Pose_EST.CTL	
Z	Ζ	X	X	N/A	TIMER.CTL	

FRC_LabVIEW_Trajectory_Library_Routines.xlsx Page 38 / 39

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

FRC_LabVIEW_Trajectory_Library_Routines.xlsx Page 39 / 39