Revision 3.05 3/01/2023 – Added execute routines for state space sim and ctrl

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...

X X X X SI

FunctionGeneratorMatrix New.vi

Doc completed Pct 92.96% Optimization Pct 56.65%

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

BASE '=======

nented
nented
plLIB
tem
doutine
e Program
rogram

BUMPLESS TRANSFER X X X X X I BumplessTransfer\_Execute.vi

Function Prototype Notes FUNCTION GENERATOR  $X \mid X$ Similar to interpolated tree map.. FunctionGenerator\_Add\_Value.vi XX XI FunctionGenerator Add XY.vi Similar to interpolated tree map. FunctionGenerator\_Calculate.vi XX X I Similar to interpolated tree map... X X X X SI X X X X X I FunctionGenerator Clear.vi FunctionGenerator Execute.vi Similar to interpolated tree map...

| X | X | X | SI | FunctionGenerator New.vi | Similar to interpolated tree map... | Similar to interpolated

Page 1 / 40

Similar to interpolated tree map.

Revision 3.05 3/01/2023 – Added execute routines for state space sim and ctrl Function Prototype Notes LEAD LAG X X X X I LeadLag Execute.vi VI Name Function Prototype Notes LINEAR FILTER X X XI LinearFilter BackwardFiniteDifference.vi XX X SI LinearFilter Calculate.vi LinearFilter\_CutoffFrequency.vi X X X X X X X X X I X LinearFilter Execute.vi Labview style helper LinearFilter Factorial.vi AN INTERNAL ROUTINE No I XX XI LinearFilter FiniteDifference.vi 
 X
 X
 X

 X
 X
 X

 X
 X
 X
 LinearFilter\_HighPass.vi LinearFilter\_HighPassBW1.vi X X X X X X X X LinearFilter HighPassBW2.vi LinearFilter LowPassBW1.vi X X X X X LinearFilter\_LowPassBW2.vi LinearFilter\_MovingAverage.vi XX XX LinearFilter\_New.vi X LinearFilter Reset.vi LinearFilter ResetToValue.vi LinearFilter SinglePoleIIR.vi X X X X X LinearFilter TimeConst.vi Function Prototype VI Name Notes MEDIAN FILTER X X MedianFilter Calculate.vi X X X X X MedianFilter Execute.vi Labview style helper X SI X SI MedianFilter New.vi XX MedianFilter Reset.vi MedianFilter ResetToValue.vi  $X \mid X \mid X \mid X \mid SI$ Function Prototype Notes SLEW RATE FILTER X X SlewRateLimiter\_Calculate.vi X X X X X SI SlewRateLimiter Close.vi SlewRateLimiter Execute.vi X X X X Labview style helper X X X X SI SlewRateLimiter GetRate.vi XX X I SlewRateLimiter New.vi SlewRateLimiter\_NewInitialZero.vi  $X \mid X \mid$ X XX X SlewRateLimiter Reset.vi X SI SlewRateLimiter SetRate.vi Not WPILIB Function Prototype Notes

3/01/2023 – Added execute routines for state s	ER X X X X		Timer Close.vi		releases semaphore			
TIME	XXXX		X Timer Get.vi		Totalog semaphore			
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		Timer GetAndReset.vi					
	X X X No		Timer GetInternal.vi		Internal (private) only			
	X X X X		X Timer HasPeriodPassed.vi		internal (private) only			
	X X X X		X Timer HasPeriodPassedOnce.vi					
	X X X		X Timer New.vi					
	X X X		X Timer Reset.vi					
	X X X No		Timer ResetInternal		Internal (private) only			
	X X X X		Timer Restart.vi		y , ,			
	X X X		X Timer Start.vi					
	X X X No		Timer StartInternal.vi					
	X X X		X Timer Stop.vi					
	X X X No		Timer_StopInternal.vi		Internal (private) only			
	mplemented Documented Vot WPILIB Menu Item	Routine	le Program			Review	Program	
	cur r N scu	+	<del>d</del>			qe	st F	
	Impl Doc Not Men	Test	ຮັ້ງ VI Name	Function Prototype	Notes	ŏ	Test	
TIME INTERPOLATABLE BOOLEA			TimeInterpBoolean AddSample.vi		Update to use create matrix			
	X X X No I		TimeInterpBoolean_CleanUp.vi		Update to use create matrix			
	X X X X SI		TimeInterpBoolean_Clear.vi					
	X X X X SI		TimeInterpBoolean_GetNewestSample.vi					
	X X X X I		TimeInterpBoolean_GetSample.vi					
			TimeInterpBoolean_GetTimeForValue.vi					
	X X X X SI		TimeInterpBoolean_New.vi					
	X X X X SI		TimeInterpBoolean_PopOldestSample.vi					
	X X X X SI		T					
	ted IB Optimized	nutine	TimeInterpBoolean_SetMaxTime.vi			eview	ogram	
TIME INTERPOLATABLE DOUBLE	X		VI Name  TimeInterpDouble AddSample.vi TimeInterpDouble CleanUp.vi TimeInterpDouble Clear.vi TimeInterpDouble GetNewestSample.vi TimeInterpDouble GetSample.vi TimeInterpDouble GetSample.vi TimeInterpDouble GetSample.vi	Function Prototype	Notes Update to use create matrix Update to use create matrix	Code Review	Test Program	
TIME INTERPOLATABLE DOUBLE	X	Test	VI Name  TimeInterpDouble AddSample.vi TimeInterpDouble_CleanUp.vi TimeInterpDouble_Clear.vi TimeInterpDouble_GetNewestSample.vi TimeInterpDouble_GetSample.vi TimeInterpDouble_GetTimeForValue.vi TimeInterpDouble_New.vi	Function Prototype	Update to use create matrix	Code Review	Test Program	
TIME INTERPOLATABLE DOUBLE	Execution Optimized	Test	VI Name TimeInterpDouble AddSample.vi TimeInterpDouble CleanUp.vi TimeInterpDouble_Clear.vi TimeInterpDouble_GetNewestSample.vi TimeInterpDouble_GetSample.vi TimeInterpDouble_GetTimeForValue.vi TimeInterpDouble_New.vi TimeInterpDouble PopOldestSample.vi	Function Prototype	Update to use create matrix	Code Review	Test Program	
TIME INTERPOLATABLE DOUBLE	X	t Routine Test	VI Name  TimeInterpDouble AddSample.vi TimeInterpDouble CleanUp.vi TimeInterpDouble GetNewestSample.vi TimeInterpDouble GetSample.vi TimeInterpDouble GetSample.vi TimeInterpDouble PopOldestSample.vi TimeInterpDouble SetMaxTime.vi	Function Prototype	Update to use create matrix	Review	st Program Test Program	
TIME INTERPOLATABLE DOUBLE	Menu Item  Mot WPILIB  Menu Item  TX X X X X X X X X X X X X X X X X X X	t Routine Test	VI Name  TimeInterpDouble AddSample.vi TimeInterpDouble CleanUp.vi TimeInterpDouble GetNewestSample.vi TimeInterpDouble GetSample.vi TimeInterpDouble GetSample.vi TimeInterpDouble GetTimeForValue.vi TimeInterpDouble New.vi TimeInterpDouble PopOldestSample.vi TimeInterpDouble SetMaxTime.vi	Function Prototype  Function Prototype	Update to use create matrix	Code Review	Test Program	
TIME INTERPOLATABLE DOUBLE	Menu Item    Secution Optimized   Execution Optimized   Manual Ma	t Routine Test	VI Name  TimeInterpDouble AddSample.vi TimeInterpDouble CleanUp.vi TimeInterpDouble GetNewestSample.vi TimeInterpDouble GetSample.vi TimeInterpDouble GetSample.vi TimeInterpDouble PopOldestSample.vi TimeInterpDouble SetMaxTime.vi		Update to use create matrix Update to use create matrix	Review	Test Program	
	N	t Routine Test	VI Name  TimeInterpDouble AddSample.vi TimeInterpDouble CleanUp.vi TimeInterpDouble GetNewestSample.vi TimeInterpDouble GetSample.vi TimeInterpDouble GetSample.vi TimeInterpDouble GetTimeForValue.vi TimeInterpDouble PopOldestSample.vi TimeInterpDouble SetMaxTime.vi  WI Name  TimeInterpPose2d AddSample.vi TimeInterpPose2d CleanUp.vi		Update to use create matrix Update to use create matrix  Notes	Review	Test Program	
	X	t Routine Test	VI Name  TimeInterpDouble_AddSample.vi TimeInterpDouble_CleanUp.vi TimeInterpDouble_Clear.vi TimeInterpDouble_GetNewestSample.vi TimeInterpDouble_GetSample.vi TimeInterpDouble_New.vi TimeInterpDouble_PopOldestSample.vi TimeInterpDouble_SetMaxTime.vi		Update to use create matrix Update to use create matrix  Notes Update to use create matrix	Review	Test Program	
		t Routine Test	VI Name  TimeInterpDouble AddSample.vi TimeInterpDouble CleanUp.vi TimeInterpDouble GetNewestSample.vi TimeInterpDouble GetSample.vi TimeInterpDouble GetSample.vi TimeInterpDouble New.vi TimeInterpDouble PopOldestSample.vi TimeInterpDouble SetMaxTime.vi		Update to use create matrix Update to use create matrix  Notes Update to use create matrix	Review	Test Program	
	X	t Routine Test	TimeInterpDouble_CleanUp.vi TimeInterpDouble_CleanUp.vi TimeInterpDouble_Clear.vi TimeInterpDouble_GetNewestSample.vi TimeInterpDouble_GetSample.vi TimeInterpDouble_Mew.vi TimeInterpDouble_PopOldestSample.vi TimeInterpDouble_SetMaxTime.vi  TimeInterpDouble_SetMaxTime.vi		Update to use create matrix Update to use create matrix  Notes Update to use create matrix	Review	Test Program	
	Not WPILIB   Not	t Routine Test	VI Name  TimeInterpDouble AddSample.vi TimeInterpDouble Clean.Up.vi TimeInterpDouble Clear.vi TimeInterpDouble GetNewestSample.vi TimeInterpDouble GetSample.vi TimeInterpDouble GetTimeForValue.vi TimeInterpDouble PopOldestSample.vi TimeInterpDouble SetMaxTime.vi  TimeInterpDouble SetMaxTime.vi		Update to use create matrix Update to use create matrix  Notes Update to use create matrix	Review	Test Program  Test Program	
	X	t Routine Test	VI Name  TimeInterpDouble AddSample.vi TimeInterpDouble CleanUp.vi TimeInterpDouble GetNewestSample.vi TimeInterpDouble GetSample.vi TimeInterpDouble GetSample.vi TimeInterpDouble Mew.vi TimeInterpDouble PopOldestSample.vi TimeInterpDouble SetMaxTime.vi  TimeInterpDouble SetMaxTime.vi		Update to use create matrix Update to use create matrix  Notes Update to use create matrix	Review	Test Program  Test Program	
	Not WPILIB   Not	Test Routine Test	VI Name  TimeInterpDouble AddSample.vi TimeInterpDouble Clean.Up.vi TimeInterpDouble Clear.vi TimeInterpDouble GetNewestSample.vi TimeInterpDouble GetSample.vi TimeInterpDouble GetTimeForValue.vi TimeInterpDouble PopOldestSample.vi TimeInterpDouble SetMaxTime.vi  TimeInterpDouble SetMaxTime.vi		Update to use create matrix Update to use create matrix  Notes Update to use create matrix	Review	Test Program  Test Program	

Revision 3.05 3/01/2023 – Added execute routines for state space sim and ctrl Function Prototype Notes TIME INTERPOLATABLE ROTATION2D XX TimeInterpRotation2d AddSample.vi Update to use create matrix X X X No I TimeInterpRotation2d CleanUp.vi Update to use create matrix TimeInterpRotation2d Clear.vi X X X X SI TimeInterpRotation2d\_GetNewestSample.vi X X X X SI TimeInterpRotation2d GetSample.vi X X X X I TimeInterpRotation2d GetTimeForValue.vi X X X X SI TimeInterpRotation2d\_New.vi X X X X SI TimeInterpRotation2d\_PopOldestSample.vi TimeInterpRotation2d SetMaxTime.vi X X X X SI VI Name Function Prototype Notes X TIME INTERPOLATABLE VARIANT XXI TimeInterpVariant\_AddSample.vi Update to use create matrix X No I TimeInterpVariant CleanUp.vi Update to use create matrix X X X X SI TimeInterpVariant\_Clear.vi TimeInterpVariant\_GetNewestSample.vi X X X X SI TimeInterpVariant\_GetSample.vi X X X X I TimeInterpVariant GetTimeForValue.vi X X X X I TimeInterpVariant\_Interpolate.vi This is a template for a user created routine. X X X X SI X X X X SI TimeInterpVariant\_New.vi TimeInterpVariant\_PopOldestSample.vi TimeInterpVariant SetMaxTime.vi X X X X SI Function Prototype Notes WAIT ADJUST X X X X WaitAdjust.vi Function Prototype Notes DIGITAL SEQUENTIAL LOGIC X X X X DigSeqLogic\_Delay.vi XX XX DigSeqLogic\_On\_Delay.vi X X X X DigSeqLogic\_Off\_Delay.vi X X X X DigSeqLogic\_One\_Shot.vi  $X \mid X \mid X \mid X$ DigSeqLogic\_SR\_Flip\_Flop.vi Function Prototype Notes DEBOUNCER X X Debouncer\_New.vi X 
 X
 X
 X

 X
 X
 X

 X
 X
 X
 Debouncer Calculate.vi Debouncer Execute.vi Debouncer Reset.vi XX No XX No Debouncer HasElapsed.vi

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

									•				
					Ø								
					Execution Optimized		~						
					tin		Program					~	δι
	je q	pa	ø	~	õ	ne	90				Review	Program	Żi
	mplementea	Documented	Not WPILIB	Menu Item	ion	Test Routine	ď				Sev	ıβa	, per
	em	Ě	Ŋ	n n	cnt	Æ	θĮdι				UZ O	Ţ	Ő
	ldu	000	lot	1en	ě	est	Sample	VI Name	Function Prototype	Notes	Code	Test	2
ARM FF		X	_<_	<u> </u>	Ш	_	<u>ν</u>	ArmFF Calculate.vi	Function Flototype	Notes			<u> </u>
AINWITT	X	X		X				ArmFF_CalculateVelocityOnly.vi					
			X					ArmFF_Execute.vi		LabVIEW style single call			
			X					ArmFF_ExecuteVelocityOnly.vi		LabVIEW style single call			
	Χ	Х		Х				ArmFF_MaxAchieveAccel.vi		, ,			
	X	X		Χ				ArmFF_MaxAchieveVelocity.vi					
	Χ	X		Χ				ArmFF_MinAchieveAccel.vi					
	X	Χ		Χ				ArmFF_MinAchieveVelocity.vi					
	X	X		Χ				ArmFF_New_ZeroGravity.vi					
	X	X		Χ				ArmFF_New.vi					
					D								
					įΣ								
					tim		am						Ø
	eq	þe	g		Ö	ae 2	ogu				eκ	am	kin
	ent	əntı	7	em	00	ŭ	Ţ				evi	J <sub>g</sub> c	hec
	Implementea	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	nple				Code Review	Ą	Õ
	β	700	ot	len	χec	est		V (1 A)	5 ° 5 ' '	N	oqe	Test	<u>Ş</u>
DANC DANC			_ <_	_ <u>X</u>	Щ С	<u> </u>		VI Name	Function Prototype	Notes	<u> </u>	<u> </u>	<u> </u>
BANG BANG		X		X	SI SI			BangBang_AtSetpoint.vi BangBang_Calculate_PV.vi					
	X	X		X	SI			BangBang_Calculate_Pv.vi BangBang_Calculate_SP_PV.vi					
	$\hat{X}$	Y	X	X	SI			BangBang_Execute.vi					
	X	X		X	SI			BangBang_GetAll.vi					
	X	X		X	SI			BangBang_GetError.vi					
	X	X		X	SI			BangBang_New.vi					
	X	X		X	SI			BangBang_SetSetpoint.vi					
	X	Х		Х	SI			BangBang_SetTolerance.vi					
					_								
					Optimized								
					imi		ш						6
	þ	ō	~		Opt	ø	Progran				8	E	King
	Implemented	Documented	Not WPILIB	шé		Test Routine	P				Review	Test Program	ec
	ne u	ше	ΝĐ	Menu Item	Execution	Rol	Sample				Ϋ́	P <sub>70</sub>	ઇ
	9/di	noc	× 7	ent	ec	st	ш				Code	st	70
			ຸ ≥ັ_			<del>_</del>	Š	VI Name	Function Prototype	Notes	<u> </u>		Err
ONTROLLER UTIL	X	X		X	SI			ControllerUtil_GetModulusError.vi		This was short lived in WPILIB, but			
										still useful here.		l	<u> </u>
					þ								
					Execution Optimizea		2						
					otin		ra				_	-	ρι
	tea	ted	18	2	ŏ	ine	Sample Program				Code Review	ran	cki
	Implemente	Documented	Not WPILIB	Menu Item	ion	Test Routine	J.				ge/	ığo,	'ne
	len.	E D	Ž	l n	cut	ă,	λdι				e F	t P	ř O
	пр	90	10t	1en	ž	esi	an	VI Name	Function Prototype	Notes	90	Test	Erro
ELEV FF			_<_	<u> </u>	Щ	_		ElevFF_Calculate.vi	i undudit i fototype	NOIGS			Ш
	X	X		X				ElevFF_CalculateVelocityOnly.vi					
			X	^				ElevFF_Execute.vi		LabVIEW style single call			
			X					ElevFF ExecuteVelocityOnly.vi		LabVIEW style single call			
	X	X	T	X				ElevFF_MaxAchieveAccel.vi					
	X	X		X				ElevFF_MaxAchieveVelocity.vi					
	Χ	X		X				ElevFF_MinAchieveAccel.vi					
	Χ	X		X				ElevFF MinAchieveVelocity.vi					
	X	X		X				ElevFF New ZeroAccel.vi					
	X	X		X				ElevFF_New.vi					

023 – Added execute routines for state sp		nd ctrl					<del></del>				
023 – Added execute routines for state sp	Jace Siiii ai	iu ciii		p							
				ize	,						
				ţi	an					_	ğ
	<i>p</i> <sub>6</sub>	m		9 5	ρ jg				Ø.	ш	Ķ Ë
	ente ente	ij	ltem	, i	2				Review	ge	၁ဓ
	ne ne	Ð	#e	cution Op	e Ş				ď	27	$\mathcal{E}$
	e ins	Vot WPILIE	nu	Execution Test Rout	is du				Code	st I	jo.
	Ē S	≥	Me	Exec	Sa	VI Name	Function Prototype	Notes	රි	Je Je	Ē
HOL_DRV_CTRL	XX	X	X			HolDrvCtrl AdvCalculate Trajectory.vi		Added 1/24/2022	T		
	XX	X				HolDrvCtrl_AdvCalculate.vi		Added 1/24/2022			
	XX		X	SI		HolDrvCtrl AtReference.vi		Added 1/26/21			
	XX		Χ	1		HolDrvCtrl_Calculate_Trajectory.vi		Added 1/26/21			
	XX		X	1		HolDrvCtrl_Calculate.vi		Added 1/26/21			
		X				HolDrvCtrl_Execute_Trajectory.vi		Added 1/24/2022			
	XX	X	X			HolDrvCtrl Execute.vi		Future	<b>†</b>		
	X X		X	SI		HolDrvCtrl New.vi		Added 1/26/21	<del>                                     </del>		
	X X					HolDrvCtrl PackExecuteSP.vi		714404 1720/21	+		
	X X	X	X			HolDrvCtrl PackPID.vi		Added 1/24/2022	+		
	X X	$\frac{\lambda}{X}$	X	$\overline{}$		HolDrvCtrl PackProfPID.vi		Added 1/24/2022	+		
	$\begin{array}{ c c c c c }\hline X & X \\ \hline \end{array}$			SI		HolDrvCtrl_SetEnabled.vi		Added 1/24/2022 Added 1/26/21	+		
	$\begin{array}{ c c c c c } \hline X & X \\ \hline \end{array}$		X			HolDrvCtrl SetTolerance.vi		Added 1/26/21	+		
	_ ^ _ ^		_ ^	31		HOIDIVCIII_SetTolerance.vi		Added 1/20/21			
				70							
				ž.							
				ij.	am						Ø
	9 9	~		, pt	n g				<b>&gt;</b>	Ē	din (
	at at	9	8	1 2	1 6				Ϋ́	gra	ec/
	ne ne	WPILI	ltem	ج <u>ن</u> و	je je				Re	<u>ē</u>	ર્ક
	je je	3	nu	) t	n du				ge	3t F	ò
	III DO	Not	Menu	Execution Op Test Routine	sample Sample	VI Name	Function Prototype	Notes	Ö	ě	Į.
PID AUTOTUNE					- 0,	PIDAutoTune_ClosedLoopStep.vi				1	7
1.270.0.012		X				PIDAutoTune_Convert_Academic_To_NonInteracting.vi			+		
	X X	X	No			PIDAutoTune_OpenLoopStep.vi			+		
	X X	X	X			PIDAutoTune_SetTuningArguments.vi			+		
	X X	$\frac{\lambda}{X}$	X			PIDAutoTune Step Execute.vi			+		
	XX					IB/Nato Falle_Gtop_Excoate.vi					
	'mplemented Documented	t WPILIB	Menu Item	Execution Op	st noutifie mple Prog				de Revien	st Progran	or Checki
	= 0	Not	Me	Ä F	San	VI Name	Function Prototype	Notes	රි	Test	En
PID CONTROLLER	R X X		X			PIDController_AdvCalculate_FF_Sp_Pv_Per.vi		Advanced PID			
	XX		X			PIDController_AdvCalculate_FF_Sp_Pv.vi		Advanced PID			
	XX	X	X		X	PIDController_AdvExecute.vi		Labview style helper. Advanced			
								PID			
	XX			SI		PIDController_AtSetpoint.vi					
	XX		Χ			PIDController_Calculate_PV.vi					
	XX		Χ			PIDController_Calculate_SP_PV.vi					
	XX		X	SI		PIDController_DisableContinousInput.vi					
	XX		X	SI		PIDController_EnableContinousInput.vi					
	XX	X	X		X	PIDController Execute.vi		Labview style helper			
						PIDController GetContinuousError.vi		OBSOLETE – Removed			
	XX		Χ	SI		PIDController_GetPeriod.vi					
	XX		X			PIDController_GetPID.vi					
	X X		X		$\neg$	PIDController GetPositionError.vi			†		
	X X		X	SI	+	PIDController GetSetpoint.vi			<b>T</b>		
	X X		X		_	PIDController_GetTolerance.vi			+		
	$\begin{array}{ c c c c c }\hline X & X \\ \hline \end{array}$		X		-	PIDController_GetVelocityError.vi			+		
	$\begin{array}{ c c c c c }\hline X & X \\ \hline \end{array}$			SI	_	PIDController IsContinuousInputEnabled.vi			+		
	$\begin{array}{ c c c c c }\hline X & X \\ \hline X & X \\ \hline \end{array}$		X	1	+	PIDController New.vi			+		
	$\begin{array}{c c} X & X \\ X & X \end{array}$		X	1	+	PIDController_New.vi PIDController NewPeriod.vi			+		
					_				+		
		X			-	PIDController_Pack_AdvLimits.vi			+		
		X			_	PIDController_Pack_AdvTuning.vi					
		X				PIDController_Pack_ErrorTolerance.vi					
	$X \mid X$	X	Χ	SI	$\perp$	PIDController_Pack_InputLimits.vi			1		
	XX	X			$\perp$	PIDController_Pack_Tuning.vi					
	XX		Χ			PIDController_Reset.vi					
	XX			SI		PIDController_SetD.vi					
	XX	X	X	SI		PIDController_SetDerivativeFilter.vi		Advanced PID			
	XX	X	No			PIDController_SetFeedForward_OBSOLETE_DELETE.vi		Advanced PID, Obsolete –	<u> </u>		
								DELETE	4	I .	1

70 172020 Traded exceded fourilles for state	space sim and ctr			PIDController SetFFGain OBSOLE	TE DELETE VI	Advanced PID, Obsolete –	
					E_DELETE.VI	DELETE DELETE	
	X X	X	SI	PIDController_Setl.vi		ODOGLETE D	
	XX	V	SI	PIDController_SetInputRange.vi PIDController_SetIntegratorRange.vi		OBSOLETE – Removed	
	X X X			PIDController_SetIntegratorKange.vi		Advanced PID	
	XX	X	SI	PIDController SetP.vi		/ AVAITOGET 12	
	XXX	X X	SI	PIDController_SetPeriod.vi			
	XX		SI	PIDController_SetPID.vi			
	X X X	X X	SI	PIDController_SetPIDF.vi		Advanced PID	
	XX	X	SI	PIDController_SetSetpoint.vi			
	X X X		SI SI	PIDController_SetTolerance.vi PIDController SetTolerancePandV.v			
		^	751	r ibcontioner_derroterancer andv.v			
	plemented ocumented	Not WPILIB Menu Item	recution Optimized	Test Routine Sample Program emen		ode Review	ist Program
	<u> </u>				Function Prototype	Notes 8	Θ <u>'</u>
PROFILED PID CONTROLL		X		ProfiledPIDController_AtGoal.vi			
	X   X   X   X   X   X   X   X   X   X	X		ProfiledPIDController_AtSetpoint.vi ProfiledPIDController Calculate Mea	no Cool vi		
	XX	X		ProfiledPIDController_Calculate_Mea			
	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	X		ProfiledPIDController Calculate Mea			
	XX	$\frac{x}{X}$		ProfiledPIDController Calculate Mea			
	XX	X	SI	ProfiledPIDController_DisableContIn	out.vi		
	XX	X	SI	ProfiledPIDController_EnableContIn	ut.vi		
	$X \mid X \mid X$	X X	1	ProfiledPIDController_Execute.vi		Single call LabVIEW style function.	
	XX	X	SI	ProfiledPIDController_GetGoal.vi			
	XX		SI	ProfiledPIDController_GetPeriod.vi		MDH ID has a superior matters	
	X X X		SI SI	ProfiledPIDController_GetPID.vi ProfiledPIDController_GetPositionEr	orvi	WPILIB has separate getters.	
	XX	- <del>'</del>	SI	ProfiledPIDController_GetPositionEr  ProfiledPIDController_GetSetpoint.vi			
	$\begin{array}{c c} X & X \\ \hline X & X \\ \hline \end{array}$		SI	ProfiledPIDController GetTolerance.			
	XX	X	SI	ProfiledPIDController_GetVelocityEn			
	XX		1	ProfiledPIDController_New.vi			
	XX		1	ProfiledPIDController_NewPeriod.vi			
	XX		SI	ProfiledPIDController_Reset_PosOn			
	XX		SI	ProfiledPIDController_Reset_PosVel	Vİ		
	X   X   X   X   X   X   X   X   X   X	X	SI SI	ProfiledPIDController_Reset.vi ProfiledPIDController SetConstraints	vi		
	XX		SI	ProfiledPIDController_SetConstraints ProfiledPIDController_SetGoal_Post			
	XX	Ŷ	SI	ProfiledPIDController_SetGoal.vi	villy.vi		
	XX	X	SI	ProfiledPIDController SetIntegratorF	ange.vi		
	XX	X	SI	ProfiledPIDController_SetPID.vi			
	XX	X	SI	ProfiledPIDController SetTolerance	PosOnly.vi		
	XX	X	SI	ProfiledPIDController_SetTolerance	PosVel.vi		
	mplemented Jocumented	vor WPILIB Venu Item	Execution Optimized	Test Routine Sample Program ewen IA	Function Prototype	Notes Notes	i est Program
RAMSE	TE X X	\	SI	Ramsete AtReference.vi	AtReference	1,000	
. 3 41102	XX	X	X	Ramsete_Calculate_Trajectory.vi	calculate_trajectory		
	XX	X	X	Ramsete_Calculate.vi	calculate		
	XXX	X X	X	Ramsete_Diff_DO_Eng.vi			
	XXX	XX	X	Ramsete_Diff_DO_SI.vi	11-14-1-0		
	X X X	$\begin{array}{c c} x & X \\ Y & V \end{array}$		Ramsete_Execute_ENG.vi Ramsete Execute PackTuning EN	Use this one!!		
	XXXX	$\frac{\lambda}{\lambda} \mid \frac{\lambda}{\lambda}$	01	Ramsete_Execute_PackTuning_ENG Ramsete_Execute_PackTuning.vi	D.VI		
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			Ramsete_Execute_PackTuning.vi			
			<del></del>				
	XX	X	SI	Ramsete New B Z.vi	new(b, zeta)		
	X   X   X   X   X   X   X   X   X   X	X	SI SI	Ramsete_New_B_Z.vi Ramsete_New.vi Ramsete_SetEnabled.vi	new(b, zeta) new		

Revision 3.05 3/01/2023 – Added execute routines for state space sim and ctrl XX X Ramsete SINC.vi sinc internal Function Prototype Notes SIMPLE MOTOR FEEDFORWARD X X X X SI SimpleMotorFF Calculate CalcAccel.vi SimpleMotorFF Calculate NextV Dt.vi XX Χ X SI X SI SimpleMotorFF Calculate.vi public double calculate(double velocity, double acceleration) SimpleMotorFF\_CalculateVelocityOnly.vi public double calculate(double velocity) X X X X SimpleMotorFF Ka AutoTune.vi SimpleMotorFF\_MaxAchieveAccel.vi public double maxAchievableAcceleration(double maxVoltage, XX Χ double velocity) XX X SimpleMotorFF\_MaxAchieveVel.vi public double maxAchievableVelocity(double maxVoltage, double acceleration) XX Χ SimpleMotorFF\_MinAchieveAccel.vi public double minAchievableAcceleration(double maxVoltage, double velocity) SimpleMotorFF MinAchieveVel.vi XX Χ public double minAchievableVelocity(double maxVoltage, double acceleration) SimpleMotorFF New.vi public SimpleMotorFeedforward(double ks, double kv, double ka) Χ X X SI SimpleMotorFF Pack Ka Tune Params.vi  $X \mid X \mid X \mid X \mid SI$ public SimpleMotorFeedforward(double ks, double kv) '======== GEOMETRY '======== Function Prototype Notes COORDINATE AXIS X X X SI CoordAxis D.vi CoordAxis\_E.vi  $X \mid X$ X SI X SI CoordAxis N.vi XX X SI CoordAxis New.vi XX X SI CoordAxis S.vi X SI CoordAxis\_U.vi  $X \mid X$ XX X SI CoordAxis W.vi Function Prototype Notes COORDINATE SYSTEM X X X SI X X SI CoordSystem Convert Pose3d.vi CoordSystem\_Convert\_Rotation3d.vi XX X SI CoordSystem\_Convert\_Translation3d.vi CoordSystem\_Convert\_Transform3d.vi  $X \mid X$ X SI X SI X CoordSystem EDN.vi X SI X X SI X CoordSystem NED.vi CoordSystem\_New.vi XX X SI X CoordSystem NWU.vi Function Prototype Notes POSE2D Pose2d\_Div.VI  $X \mid X$ X SI XX X SI Pose2d\_Equals.VI boolean equals( other obj ) X Pose2d Exp.vi pose2d exp( twist2d twist ) X SI XX Pose2d\_getRotation.vi rotation2d getRotation()

can also use cluster unpack

WPILib LabVIEW Math Library – VI Implementation List Revision 3.05 3/01/2023 – Added execute routines for state space sim and ctrl X X X SI Pose2d\_getTranslation.vi translation2d getTranslation() can also use cluster unpack X X X X SI Pose2d\_getXY.vi X X X X SI X X X X I Pose2d\_getXYAngle.vi Pose2d Interpolate.vi XX XX Pose2d Log.vi twist2d log( pose2d end ) XX X SI Pose2d Minus.vi transform2d minus( pose2d other ) X SI Pose2d New TRRO.vi pose2d new( translation2d, rotation2d )  $X \mid X \mid$ X X X X X SI X SI Pose2d New.vi pose2d new( double x, double y, rotation2d ) Pose2d Plus.vi pose2d plus( transform2d other ) XX X SI Pose2d RelativeTo.vi pose2d relativeto( pose2d other ) X SI XX Pose2d Times.vi Pose2d\_TransformBy.vi pose2d transformby( transform2d other ) XX X SI pose2d new() can use cluster constant Function Prototype Notes POSE3D XX X SI Pose3d Div.vi X SI Pose3d Equals.VI XX XX XX Pose3d Exp.vi XX Pose3d\_getRotation.vi X SI X X X X SI X X X X SI Pose3d getTranslation.vi Pose3d getXYZ.vi XX XI Pose3d Interpolate.vi XX XX Pose3d\_Log.vi XX Pose3d Minus.vi X SI X SI X SI Pose3d New.vi XX Pose3d\_New\_Default.vi XX X SI Pose3d New Pose2d.vi Pose3d\_New\_Trans3dRot3d.vi X SI XX X SI X SI X X Pose3d Plus.vi Pose3d RelativeTo.vi XX No SI Pose3d RotationVectorToMatrix.vi Pose3d ToPose2d.vi XX X SI X SI Pose3d\_Times.vi XX XX X SI Pose3d TransformBy.vi VI Name Function Prototype Notes QUATERNION X X X SI Quaternion Equals.vi  $X \mid X$ X SI Quaternion Get All.vi X X Quaternion\_Get\_LVQuat.vi X SI X X X X X SI X SI Quaternion Get Vect.vi Quaternion\_Get\_W.vi XX X SI Quaternion Inverse.vi XX X SI Quaternion New.vi XX Quaternion\_New\_Default.vi X SI X X X X X SI X SI Quaternion New LVQuat.vi Quaternion Normalize.vi XX X SI Quaternion Plus.vi Quaternion\_Times.vi  $X \mid X \mid$ X SI Quaternion\_ToRotationVector.vi X SI

Function Prototype

Notes

ie rouilles for state sp	ace si	III allu	CIII	
ROTATION2D	Χ	X		

Х	(	X		X	SI	Rotation2d_CreateAngle.vi	rotation2d new( double value )		
Χ	<b>(</b>	Χ		Χ	SI	Rotation2d_CreateAngleDegrees.vi	rotation2d fromDegrees( double degrees )	convert to radians then create	
Χ	7	X		Χ	SI	Rotation2d CreateAngleRotations.vi			
Х	<b>₹</b>	Χ		Χ	SI	Rotation2d_CreateXY.vi	rotation2d new( double x, double y )		
Χ	<b>(</b>	X		Χ	SI	Rotation2d_Div.vi			
X	<b>(</b>	X		Χ	SI	Rotation2d_Equals.vi	boolean equals( rotation2d other )		
Χ	(	X	Χ	Χ	SI	Rotation2d_GetAngleCosSin.vi		New 1/26/21	
X	<b>(</b>	Χ		Χ	SI	Rotation2d_GetCos.VI	double getCos()	use cluster unpack	
Х	(	Х		X	SI	Rotation2d_GetDegrees.VI	double getDegrees()	use cluster unpack, then convert to degree	
Χ	<b>←</b>	X		Χ	SI	Rotation2d_GetRadians.VI	double getRadians()	use cluster unpack	
X	<b>(</b>	X		Χ	SI	Rotation2d_GetRotations.vi			
X	<b>(</b>	X		Χ	SI	Rotation2d_GetSin.VI	double getSin()	use cluster unpack	
Χ	<b>(</b>	X		Χ	SI	Rotation2d GetTan.VI	double getTan()	can calculate	
Х	7	X		Χ	SI	Rotation2d Interpolate.vi	- "		
X	7	X		Χ	SI	Rotation2d Minus.vi	rotation2d minus( rotation2d other )		
X		X		Χ	SI	Rotation2d Plus.vi	rotation2d plus( rotation2d other )		
X	<i>(</i>	X		Χ	SI	Rotation2d RotateBy.vi	rotation2d rotateby( rotation2d other )		
Χ	<b>(</b>	Χ		Χ	SI	Rotation2d_Times.vi	rotation2d times( double scalar )		
Χ	<b>(</b>	Χ		Χ	SI	Rotation2d_UnaryMinus.vi	rotation2d unaryminus( )		
							rotation2d new()	can use cluster constant	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
ROTATION3D	X	Χ		Χ	SI			Rotation3d_Create_AxisAngle.vi					
	X	Χ		X	SI			Rotation3d_Create_Default.vi					
	X	Χ		Χ	SI			Rotation3d_Create_Quaternion.vi					
	X	Χ		Χ	1			Rotation3d_Create_InitialFinalVector.vi					
	X	Χ		Χ	SI			Rotation3d_Create_RollPitchYaw.vi					
	X	Χ		Χ	1			Rotation3d_Create_RotMatrix.vi					
	X	Χ		Χ	SI			Rotation3d_Div.vi					
	X	Χ		Χ	SI			Rotation3d_Equals.vi					
	X	Χ	Χ	Χ	SI			Rotation3d_GetAxisAngle.vi					
	X	Χ		Χ	SI			Rotation3d_GetQuaternion.vi					
	X	Χ		Χ	SI			Rotation3d_GetXYZ.vi					
	X	Χ		Χ	SI			Rotation3d_Interpolate.vi					
	X	Χ		Χ	SI			Rotation3d_Minus.vi					
	X	Χ		Χ	SI			Rotation3d_Plus.vi					
	X	Χ		Χ	SI			Rotation3d_RotateBy.vi					
	X	Χ		Χ	SI			Rotation3d_Times.vi					
	X	Χ		Χ	SI			Rotation3d_ToRotation2d.vi					
	X	Χ		Χ	SI			Rotation3d_UnaryMinus.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimize	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
TRANSFORM2D	X	Χ		Χ	SI			Transform2d_Create_PosePose.vi	transform2d new( pose2d, pose2d )				
	Χ	Χ		Χ	SI			Transform2d_Create_TransRot.vi	transform2d new( translation2d, rotation2d )				
	Χ	Χ		Χ	SI			Transform2d_Div.vi					
	Χ	Χ		Χ	SI			Transform2d_Equals.VI	boolean equals( other transform2d )				
	Χ	Χ		Χ	SI			Transform2d_GetRotation.VI	rotation2d getRotation()	use cluster unpack			
	Χ	Χ		Χ	SI			Transform2d_GetTranslation.VI	translation2d getTranslation()	use cluster unpack			
	Χ	Χ	X	Χ	SI			Transform2d_GetXY.vi					
	Χ	Χ	X	Χ	SI			Transform2d_GetXYAngle.vi					
	Χ	Χ		Χ	SI			Transform2d_Inverse.vi	transform inverse()	new			
	Χ	Χ		Χ	Si			Transform2d_Plus.vi					
	Χ	Χ		Χ	SI			Transform2d_Times.vi	transform2d times( double scalar )				
									transform2d new( )	can use cluster constant			

Revision 3.05 3/01/2023 – Added execute routines for state space sim and ctrl Function Prototype Notes TRANSFORM3D XX X SI Transform3d Create Default.vi XX X SI Transform3d Create Pose3dPose.3dvi Transform3d Create Trans3dRot3d.vi  $X \mid X$ X SI Transform3d Div.vi X X X SI Transform3d Equals.VI X SI X SI Transform3d GetRotation3d.VI XX X SI Transform3d GetTranslation3d.VI Transform3d GetXYZ.vi X X X X SI XX Transform3d Inverse.vi X SI X Si Transform3d Plus.vi XX X SI Transform3d Times.vi Function Prototype Notes TRANSLATION2D X X Translation2d Create DistAng.vi X SI Translation2d\_Create.vi X SI translation2d new( double x, double y )  $X \mid X$ Translation2d Div.vi SI XX X SI Translation2d Equals.vi boolean equals( translation other ) XX X SI Translation2d GetAngle.vi X SI Translation2d GetDistance.vi double getDistance( translation2d other )  $X \mid X$ X SI X SI can use cluster unpack Translation2d GetNorm.VI double getNorm() XX Translation2d GetX.VI double getX() can use cluster unpack X X X X SI Translation2d GetXY.VI X SI Translation2d GetY.VI double getY() can use cluster unpack Translation2d\_Interpolate.vi XX X SI XX X SI Translation2d Minus.vi translation2d minus( translation2d other ) X SI XX Translation2d Plus.vi translation2d plus( translation2d other ) XX X SI Translation2d RotateBy.vi translation2d rotateBy( rotation2d other ) Translation2d\_Times.vi translation2d times( double scalar ) XX X SI Translation2d UnaryMinus.vi X SI translation2d unaryminus() translation2d new() can use cluster constant translation2d div( double scalar ) can multiply by 1/scalar Function Prototype Notes TRANSLATION3D X X X SI Translation3d Create.vi Translation3d\_Create\_Default.vi  $X \mid X$ X SI Translation3d Create\_DistAng.vi X X X SI X SI Translation3d Div.vi XX X SI Translation3d Equals.vi XX X SI Translation3d GetDistance.vi X SI Translation3d GetNorm.VI  $X \mid X$ X X X X SI X X X SI Translation3d GetXYZ.vi Translation3d Interpolate.vi Translation3d Minus.vi XX X SI XX X SI Translation3d Plus.vi Translation3d\_RotateBy.vi  $X \mid X$ X SI X SI X SI Translation3d Times.vi X X Translation3d ToTranslation2d.vi XX X SI Translation3d UnaryMinus.vi

TWIST2	T   Mplemented	X	Not W	X X	7 9 9 9 Execution Optimized	E.	VI Name Twist2d_Create.vi Twist2d_Equals.VI Twist2d_GetAll.VI	Function Prototype twist new( x, y, theta ) boolean equals( obj other )	Notes	Code Review	Test Program	Error Checking
TWISTS	D X X	X X		X .	S   S   Execution Optimized   X   X   Test Routine	,	VI Name Twist3d_Create.vi Twist3d_Equals.VI Twist3d_GetAll.VI	Function Prototype	Notes	Code Review	Test Program	Error Checking
'====== KINEMATICS '=========												
CHASSIS SPEED	X	X X Documented	Not N	<u>₩</u> .	19 19 19 Execution Optimized Test Routine	Sample Program	VI Name  ChassisSpeeds_FromFieldRelativeChassisSpeeds.VI  ChassisSpeeds_FromFieldRelativeSpeeds.VI  ChassisSPeeds_GetXYOmega.vi  ChassisSpeeds_New.vi	Function Prototype  chassisspeeds fromFieldRelativeSpeeds( double x, double y, double angvel, rotation2d robotangle )  chassisspeeds new ( double xvel, double yvel, double angvel ) chassisspeeds new ()	Notes  can use cluster constant	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE KINEMATIO	X	X	Not N	X X	X X Test Routine		VI Name DiffKinematics_New.vi DiffKinematics_toChassisSpeed.vi	Function Prototype  diffDriveKine new( double trackWidth ) chassisSpeeds toChassisSpeeds( diffDrWheelSpeeds )	Notes	Code Review	Test Program	Error Checking
	X	X		X .	SI X	,	DiffKinematics_ToTwist2d.vi DiffKinematics_toWheelSpeed.vi	diffDriveWheelSpeed toWheelSpeeds( chassisSpeeds )				
DIFFERENTIAL DRIVE ODOMETRY	X Implemented		N to N	X Menu Item	Execution Optimized Test Routine	<u>E</u>	VI Name DiffOdometry_Execute.vi DiffOdometry_Update.vi	Function Prototype  pose2d update( rotation2d gyro, double leftdist, double right dis  diffDrOdom new( rotation gyro, pose initial )  diffDrOdom new( rotation gyro )		Code Review	Test Program	Error Checking
								void resetPosition( pose2d, rotation2d )	incorporated into "update"			

01/2023 – Added execute routines for state sp	ace si	m and	d ctrl					_				
'					jed Zed							
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimiz	Test Routine	Nogram No	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE ODOMETRY 2	X	Χ	X	X	/		DiffDrvOdom2_Execute.vi		Replacement for orig diff drive			
	X	Χ	+	X	SI		DiffDrvOdom2_GetPose.vi		odom			
	X	X		X	1		DiffDrvOdom2_New.vi					
	Χ	Χ		Χ	SI		DiffDrvOdom2_Reset.vi					
	X	Χ		X	1		DiffDrvOdom2_Update.vi					
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE WHEEL SPEEDS					_			diffDrWheelSpeeds new()				
	X	V			X		DiffMhool Normaliza vi	diffDrWheelSpeeds new( double leftVel, double rightVel )				
	X	X	1	_ X	X		DiffWheel_Normalize.vi	void normalize( double maxVel )				
MECANUM DRIVE KINEMATICS	X	X X Documented	Not WPILIB	X X X X X X X X X X X X X X X X X X X	X	Test Routine	Workinematics_New.vi MecaKinematics_New.vi MecaKinematics_SetInverseKinematics.vi MecaKinematics_ToChassisSpeeds.vi MecaKinematics_ToTwist2d.vi MecaKinematics_ToWheelSpeeds.vi MecaKinematics_ToWheelSpeeds.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
MECANUM DRIVE MOTOR VOLTAGE	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
	hing do	one			1	1		1	I.			
	plemented	ocumented	Vot WPILIB	enu Item	cecution Optimized	Test Routine	Sample Program			Code Review	sst Program	ror Checking
MEGANUM DRIVE ORGANIZATION	7	Ğ		Ž	μÛ			Function Prototype	Notes	<u>`</u>	7e	Ē
MECANUM DRIVE ODOMETRY		X	X		X	1	MecaOdometry_Execute.vi MecaOdometry_GetKinematics.vi					
	X	X	X	X			MecaOdometry_GetKinematics.vi  MecaOdometry_GetPose.vi					
	$\hat{x}$	X	+	X			MecaOdometry_New.vi					
	X	X		X			MecaOdometry_NewDefaultPose.vi					
	Χ	X		Χ			MecaOdometry_Reset.VI					
	X	Χ		X			MecaOdometry_Update.vi					
							MecaOdometry_UpdateWithTime.vi		Removed			

Revision 3.05 3/01/2023 – Added execute routines for state space sim and ctrl Function Prototype MECANUM DRIVE WHEEL POSITION X X MecaWheelPos Get.vi SI  $X \mid X$ X SI MecaWheelPos New.vi MecaWheelPos Sub.vi  $X \mid X$ X SI VI Name Function Prototype Notes MECANUM DRIVE WHEEL SPEEDS X X MecaWheel New.Vi public MecanumDriveWheelSpeeds(double SI Χ frontLeftMetersPerSecond. double frontRightMetersPerSecond. double rearLeftMetersPerSecond, double rearRightMetersPerSecond) X X X X SI MecaWheel GetAll.vi MecaWheel Normalize.vi public void normalize(double attainableMaxSpeedMetersPerSecond) Function Prototype Notes SWERVE DRIVE KINEMATICS X X X X SwerveKinematics New4.VI For 4 module drives SwerveKinematics NewX.VI  $X \mid X \mid X \mid X$ uses array as input SwerveKinematics\_NormalizeWheelSpeeds.vi public static void normalizeWheelSpeeds(SwerveModuleState[] moduleStates, double attainableMaxSpeedMetersPerSecond) X X X X SwerveKinematics ToChassisSpeeds4.VI For 4 module drives X X X X SwerveKinematics ToChassisSpeedsX.VI uses array as input SwerveKinematics\_ToSwerveModuleStates.VI public SwerveModuleState[] XX toSwerveModuleStates(ChassisSpeeds chassisSpeeds, Translation2d centerOfRotationMeters) SwerveKinematics\_ToSwerveModuleStatesZeroCenter.VI Χ Χ Χ public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds) XX Χ SwerveKinematics ToTwist2d4.VI XX SwerveKinematics\_ToTwist2dX.VI public SwerveDriveKinematics(Translation2d... wheelsMeters) variable parameters (replace with array and "4" calls) public ChassisSpeeds toChassisSpeeds(SwerveModuleState... variable parameters (replace with array and "4" calls) Function Prototype Notes SWERVE DRIVE ODOMETRY SwerveOdometry Execute4.vi SwerveOdometry ExecuteX.vi SwerveOdometry\_GetPosition.VI public Pose2d getPoseMeters() Χ X X Χ SwerveOdometry New.VI public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose)
public SwerveDriveOdometry(SwerveDriveKinematics kinematics, X SwerveOdometry\_NewZeroCenter.VI X Rotation2d gyroAngle)  $X \mid X$ Χ SwerveOdometry ResetPosition.VI public void resetPosition(Pose2d pose, Rotation2d gyroAngle) SwerveOdometry\_Update4.VI  $X \mid X \mid X \mid X$ For 4 module drives SwerveOdometry\_UpdateWithTime4.VI REMOVED REMOVED SwerveOdometry\_UpdateWithTimeX.VI X X X X SwerveOdometry UpdateX.VI uses array as input Х public Pose2d updateWithTime(double currentTimeSeconds, variable parameters (replace with Rotation2d gyroAngle, SwerveModuleState... moduleStates) array and "4" calls)

	Implemente	Documente	Not WPILIE	Menu Item	Execution (	Test Routin	Sample All Name	Function Prototype Notes	Code Revie	Test Progra	Error Check
SPLINE PARAMETERIZER	X	X		X			SplineParam_Spline_T0_T1.vi	public static List <posewithcurvature> parameterize(Spline spline, double t0, double t1)</posewithcurvature>			
	X	X		Х		X	SplineParam_Spline.vi	public static List <posewithcurvature> parameterize(Spline spline)</posewithcurvature>			
	X	X	X	No			SplineParam_StackGet.vi	internal			
	X	X	X	No			SplineParam_StackPop.vi	internal			
	Χ	X	X	No			SplineParam_StackPush.vi	internal			

'===== TRAJECTORY

'========

					nize	8		
	mented	nented	Not WPILIB		Execution Optin Test Routine	le Prograr	Review	Program
	ıpleı	Documen	Not W	5	Execu Test F	amp	o o de	est F
TRAJECTORY	, <u> </u>	X			i F	ຽ VI Name Trajectory_Concatenate.vi	Function Prototype Notes &	
TRAJECTORT	$\begin{array}{ c c c c c }\hline X & & & \\\hline \end{array}$		X			Trajectory_concatenate.vi	boolean equals( other obj ) FUTURE	
		$\hat{x}$	$\frac{1}{\lambda}$	( ;	31	Trajectory_equals.vi	public List <state> getStates() not needed, use unpack</state>	
		X	$\frac{\hat{x}}{\hat{x}}$		S/	Trajectory_GetTotalTime.vi	public double getTotalTimeSeconds()  not needed, use unpack	
		X	N		3/	Trajectory_lerp_double.vi	private static double lerp(double startValue, double endValue, internal	
	X	X	N	0	S <i>I</i>	Trajectory_lerp_Pose.vi	double t) private static Pose2d lerp(Pose2d startValue, Pose2d endValue, internal double t)	
	X		Χ	( ;	SI	Trajectory_New_Empty.vi		
	X		Χ	( ;	SI	Trajectory_New.vi	public Trajectory(final List <state> states)</state>	
	X	X	Χ	(		Trajectory_RelativeTo.vi	public Trajectory relativeTo(Pose2d pose)	
	X	X	X	(		Trajectory_Sample.vi	public State sample(double timeSeconds)	
	X	X	XX	(		Trajectory_SampleReverse.vi	Sample in reverse order. Negate	
							sample.	
	X	X	X	(		Trajectory_TransformBy.vi	public Trajectory transformBy(Transform2d transform)	
							public Pose2d getInitialPose() can use cluster unpack, array index	
	plemented	Documented	Not WPILIB		Execution Optin Test Routine	ample Progran	rde Review	st Program
	lu <sub>1</sub>	<u> </u>	_ =		Y e	ິ່ງ VI Name	Function Prototype Notes 🖔	7e
TRAJECTORY_STATE			λ	( )	SI	TrajectoryState_Equals.vi	boolean equals( other obj )	
		X	X X	( ;	SI	TrajectoryState_GetAll.vi		
		X	X	( ;	SI	TrajectoryState_GetPose.vi		
		X	X	( )	SI	TrajectoryState_Interpolate.vi TrajectoryState_New.vi	State interpolate(State endValue, double i)  public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter)	
	nted	nted	LIB		n Optimized Itine	Program	public State()	gram
	mented	mented	PILII	į į	uton Optimized Routine	le Program		Program
	olemented	umente	PILII	į į	ution Routi	mple.	de Review	~
	Implement	Document	Not WPILII	יאפוום וופו	Execution Optimized Test Routine	Sample Solution Solut	รับ อุก Function Prototype Notes	Progra
TRAJECTORY CONFIG	Implement	umente	PILII	יאפוום וופו	ution Routi	mple.	Function Prototype Notes Onlint.vi public TrajectoryConfig addConstraint(TrajectoryConstraint Implemented differently, can't	Progra
TRAJECTORY CONFIG	X Implement	Document	Not WPILII		ution Routi	VI Name  TrajectoryConfig_AddConstrai	Function Prototype  Function Prototype  int.vi  public TrajectoryConfig addConstraint(TrajectoryConstraint   Implemented differently, can't   duplicate.	Progra
TRAJECTORY CONFIG	X   Implement	X Document	Not WPILII		ution Routi	Sample Solution Solut	Function Prototype  Function Prototype  Notes  public TrajectoryConfig addConstraint(TrajectoryConstraint duplicate.  public TrajectoryConfig addConstraints(List extends public TrajectoryConstraint constraint)  TrajectoryConstraint constraints  public TrajectoryConfig(double maxVelocityMetersPerSecond,	Progra
TRAJECTORY CONFIG	X Implement	X Document	Not WPILII		Execution Test Routi	VI Name TrajectoryConfig_AddConstrai TrajectoryConfig_AddConstrai	Function Prototype  Function Prototype  Notes  O  Inint.vi	Progra
TRAJECTORY CONFIG	X   X   X	X Document	Not WPILII X		Execution Test Routi	VI Name TrajectoryConfig_AddConstrai TrajectoryConfig_AddConstrai TrajectoryConfig_Create.vi	Function Prototype  Function Prototype  Notes  public TrajectoryConfig addConstraint(TrajectoryConstraint duplicate.  Implemented differently, can't duplicate.  public TrajectoryConfig addConstraints(List extends Implemented differently, can't duplicate.  public TrajectoryConstraint constraints)  public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq)  etalAccel.vi  ints.vi public List <trajectoryconstraint> getConstraints() Implemented differently, can't</trajectoryconstraint>	Progra
TRAJECTORY CONFIG	X X X Implement	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X		Execution Test Routi	VI Name TrajectoryConfig_AddConstrai TrajectoryConfig_Create.vi TrajectoryConfig_GetCentripet TrajectoryConfig_GetConstrair	Function Prototype  Function Prototype  Notes  public TrajectoryConfig addConstraint(TrajectoryConstraint constraint)  public TrajectoryConfig addConstraints(List extends  public TrajectoryConfig addConstraints(List<? extends  TrajectoryConstraint constraints)  public TrajectoryConstraint> constraints)  public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq)  etalAccel.vi  public List <trajectoryconstraint> getConstraints()  Implemented differently, can't duplicate.</trajectoryconstraint>	Progra
TRAJECTORY CONFIG	X X X X X X X X X X X X X X 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 Well!		Execution Test Routi	VI Name TrajectoryConfig_AddConstrai TrajectoryConfig_AddConstrai TrajectoryConfig_Create.vi TrajectoryConfig_GetCentripet TrajectoryConfig_GetConstrain TrajectoryConfig_GetEndVeloc	Function Prototype  Public TrajectoryConfig addConstraint(TrajectoryConstraint duplicate.  Implemented differently, can't duplicate.	Progra
TRAJECTORY CONFIG	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X		Execution Test Routi	VI Name TrajectoryConfig_AddConstrai TrajectoryConfig_AddConstrai TrajectoryConfig_Create.vi TrajectoryConfig_GetCentripet TrajectoryConfig_GetConstrair TrajectoryConfig_GetEndVeloc TrajectoryConfig_GetKinemati	Function Prototype  Function Prototype  public TrajectoryConfig addConstraint(TrajectoryConstraint constraint)  public TrajectoryConfig addConstraints(List extends Implemented differently, can't duplicate.  Implemented differently, can't duplicate.  Implemented differently, can't duplicate.  public TrajectoryConstraint constraints)  public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq)  etalAccel.vi  ints.vi  public List <trajectoryconstraint> getConstraints()  public double getEndVelocity()  can use cluster unpack</trajectoryconstraint>	Progra
TRAJECTORY CONFIG	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X			Execution Test Routi	VI Name TrajectoryConfig_AddConstrai TrajectoryConfig_AddConstrai TrajectoryConfig_Create.vi TrajectoryConfig_GetCentripet TrajectoryConfig_GetConstrair TrajectoryConfig_GetEndVelor TrajectoryConfig_GetKinemati TrajectoryConfig_GetKinemati	Function Prototype  Function Prototype  Notes  Public TrajectoryConfig addConstraint(TrajectoryConstraint duplicate.  Public TrajectoryConfig addConstraints(List extends Implemented differently, can't duplicate.  Public TrajectoryConstraint constraints)  Public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq)  PatalAccel.vi  Public List <trajectoryconstraint> getConstraints()  Public List<trajectoryconstraint> getConstraints()  Public double getEndVelocity()  Public double getEndVelocity()</trajectoryconstraint></trajectoryconstraint></trajectoryconstraint></trajectoryconstraint></trajectoryconstraint></trajectoryconstraint>	Progra
TRAJECTORY CONFIG	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X			Execution Test Routi	VI Name TrajectoryConfig_AddConstrai TrajectoryConfig_AddConstrai TrajectoryConfig_Create.vi TrajectoryConfig_GetCentripet TrajectoryConfig_GetConstrair TrajectoryConfig_GetEndVeloc TrajectoryConfig_GetKinemati TrajectoryConfig_GetKinemati TrajectoryConfig_GetKinemati TrajectoryConfig_GetKinemati	Function Prototype  Public TrajectoryConfig addConstraint(TrajectoryConstraint duplicate.  Public TrajectoryConfig addConstraints(List extends trajectoryConstraint)  Public TrajectoryConfig addConstraints(List<? extends trajectoryConstraint constraints)  Public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxVecelerationMetersPerSecondSq)  PatalAccel.vi  Public List <trajectoryconstraint> getConstraints()  Public List<trajectoryconstraint> getConstraints()  Public List<trajectoryconstraint> getConstraints()  Public List<trajectoryconstraint> getConstraints()  Public List<trajectoryconstraint> getConstraints()  Public double getEndVelocity()  Can use cluster unpack  Public SwerveDrive.vi  Public double getEndVelocity()</trajectoryconstraint></trajectoryconstraint></trajectoryconstraint></trajectoryconstraint></trajectoryconstraint>	Progra
TRAJECTORY CONFIG	X	X			Execution Test Routi	VI Name TrajectoryConfig_AddConstrai TrajectoryConfig_AddConstrai TrajectoryConfig_Create.vi TrajectoryConfig_GetCentripet TrajectoryConfig_GetConstrair TrajectoryConfig_GetEndVeloc TrajectoryConfig_GetKinemati TrajectoryConfig_GetKinemati TrajectoryConfig_GetKinemati TrajectoryConfig_GetKinemati TrajectoryConfig_GetKinemati TrajectoryConfig_GetMaxVelA	Function Prototype  Public TrajectoryConfig addConstraint(TrajectoryConstraint constraint)  Implemented differently, can't duplicate.  Implemented differe	Progra
TRAJECTORY CONFIG	X	X			Execution Test Routi	VI Name TrajectoryConfig_AddConstrai TrajectoryConfig_AddConstrai TrajectoryConfig_Create.vi TrajectoryConfig_GetCentripet TrajectoryConfig_GetConstrair TrajectoryConfig_GetEndVeloc TrajectoryConfig_GetKinemati TrajectoryConfig_GetKinemati TrajectoryConfig_GetKinemati TrajectoryConfig_GetKinemati TrajectoryConfig_GetKinemati TrajectoryConfig_GetKinemati TrajectoryConfig_GetMaxVelA TrajectoryConfig_GetStartVeloc	Function Prototype  Function Prototype  public TrajectoryConfig addConstraint(TrajectoryConstraint duplicate.  Implemented differently, can't duplicate.  Implemented differently.  Implemented diffe	Progra
TRAJECTORY CONFIG	X	X			Execution Test Routi	VI Name  TrajectoryConfig_AddConstrai  TrajectoryConfig_AddConstrai  TrajectoryConfig_Create.vi  TrajectoryConfig_GetCentripet  TrajectoryConfig_GetConstrair  TrajectoryConfig_GetKinemati  TrajectoryConfig_GetKinemati  TrajectoryConfig_GetKinemati  TrajectoryConfig_GetKinemati  TrajectoryConfig_GetKinemati  TrajectoryConfig_GetMaxVeIA  TrajectoryConfig_GetStartVeIc  TrajectoryConfig_GetStartVeIc  TrajectoryConfig_GetStartVeIc  TrajectoryConfig_GetVoltageD	Function Prototype  Function Prototype  Solution Prototype  Public TrajectoryConfig addConstraint(TrajectoryConstraint)  Constraint)  public TrajectoryConfig addConstraints(List extends  TrajectoryConstraint onstraints)  public TrajectoryConfig(double maxVelocityMetersPerSecond,  double maxAccelerationMetersPerSecondSq)  public List <trajectoryconstraint> getConstraints()  public List<trajectoryconstraint> getConstraints()  public double getEndVelocity()  can use cluster unpack  liticsMecranumfDrive.vi  liticsMecranumfDrive.vi  liticsSwerveDrive.vi  Accel.vi  public double getStartVelocity()  can use cluster unpack</trajectoryconstraint></trajectoryconstraint>	Progra
TRAJECTORY CONFIG	X	X			29 Execution	VI Name  TrajectoryConfig_AddConstrai  TrajectoryConfig_AddConstrai  TrajectoryConfig_Create.vi  TrajectoryConfig_GetCentripet  TrajectoryConfig_GetConstrair  TrajectoryConfig_GetKinemati  TrajectoryConfig_GetKinemati  TrajectoryConfig_GetKinemati  TrajectoryConfig_GetKinemati  TrajectoryConfig_GetKinemati  TrajectoryConfig_GetMaxVelA  TrajectoryConfig_GetStartVelC  TrajectoryConfig_GetStartVelC  TrajectoryConfig_GetVoltageD  TrajectoryConfig_IsReversed.v	Function Prototype  Function Prototype  Space of the public TrajectoryConfig addConstraint(TrajectoryConstraint constraint)  public TrajectoryConfig addConstraints(List extends</td <td>Progra</td>	Progra
TRAJECTORY CONFIG	X	X			Execution Test Routi	VI Name  TrajectoryConfig_AddConstrai  TrajectoryConfig_AddConstrai  TrajectoryConfig_Create.vi  TrajectoryConfig_GetCentripet  TrajectoryConfig_GetConstrair  TrajectoryConfig_GetKinemati  TrajectoryConfig_GetKinemati  TrajectoryConfig_GetKinemati  TrajectoryConfig_GetKinemati  TrajectoryConfig_GetKinemati  TrajectoryConfig_GetMaxVeIA  TrajectoryConfig_GetStartVeIc  TrajectoryConfig_GetStartVeIc  TrajectoryConfig_GetStartVeIc  TrajectoryConfig_GetVoltageD	Function Prototype  Public TrajectoryConfig addConstraint(TrajectoryConstraint duplicate.  public TrajectoryConfig addConstraints(List extends public TrajectoryConfig addConstraints(List<? extends public TrajectoryConstraint constraints public TrajectoryConfig (double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq)  public TrajectoryConstraint> getConstraints()  public List <trajectoryconstraint> getConstraints()  public double getEndVelocity()  can use cluster unpack  iticsMeraumtDrive.vi iticsSwerveDrive.vi Accel.vi  public double getStartVelocity()  can use cluster unpack  public double getStartVelocity()  can use cluster unpack  public double getStartVelocity()  can use cluster unpack  public on use cluster unpack  public frajectoryConfig setEndVelocity(double</trajectoryconstraint>	Progra
TRAJECTORY CONFIG	X	X	X		29 Execution	VI Name  TrajectoryConfig_AddConstrai  TrajectoryConfig_AddConstrai  TrajectoryConfig_Create.vi  TrajectoryConfig_GetCentripet  TrajectoryConfig_GetConstrair  TrajectoryConfig_GetKinemati  TrajectoryConfig_GetKinemati  TrajectoryConfig_GetKinemati  TrajectoryConfig_GetKinemati  TrajectoryConfig_GetKinemati  TrajectoryConfig_GetStartVelc  TrajectoryConfig_GetStartVelc  TrajectoryConfig_GetStartVelc  TrajectoryConfig_GetVoltageD  TrajectoryConfig_setCentripeta	Function Prototype public TrajectoryConfig addConstraint(TrajectoryConstraint duplicate. public TrajectoryConfig addConstraint(TrajectoryConstraint duplicate. public TrajectoryConfig addConstraints(List extends Implemented differently, can't duplicate. public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq)  stalAccel.vi public List<TrajectoryConstraint getConstraints() public List <trajectoryconstraint> getConstraints() public double getEndVelocity() can use cluster unpack iticsSMecanumfDrive.vi public double getEndVelocity() can use cluster unpack iticsSwerveDrive.vi public double getStartVelocity() can use cluster unpack iticsSwerveDrive.vi public double getStartVelocity() can use cluster unpack iticsSwerveDrive.vi public double getStartVelocity() can use cluster unpack iticsSwerveDrive.vi public TrajectoryConfig setEndVelocity(double endVelocity(double endVelocityMetersPerSecond)</trajectoryconstraint>	Progra

Revision 3.05 3/01/2023 – Added execute routines for state space sim and ctrl TrajectoryConfig setKinematicsSwerveDrive.vi public TrajectoryConfig setKinematics(SwerveDriveKinematics SI kinematics) XX X SI public TrajectoryConfig setReversed(boolean reversed) TrajectoryConfig\_setReversed.vi public TrajectoryConfig setStartVelocity(double XX Χ TrajectoryConfig\_SetStartVelocity.vi startVelocityMetersPerSecond) X X X X SI TrajectoryConfig\_setVoltageDiffDrive.vi public double getMaxVelocity() Created function to return both public double getMaxAcceleration() Created function to return both NOTE ADD OTHER "SET" ROUTINES FOR OTHER CONTRAINTS HERE, SINCE NEW CONTRAINTS ARE SPECIFIC AND NOT GENERIC. Function Prototype TRAJECTORY GENERATE X public static Trajectory generateTrajectory( Spline.ControlVector uses cubic splines TrajectoryGenerate\_Make\_Cubic\_CtrlVect.vi initial, List<Translation2d> interiorWaypoints, Spline.ControlVector end, TrajectoryConfig config )

public static Trajectory generateTrajectory( Pose2d start, List<Translation2d> interiorWaypoints, Pose2d end,  $X \mid X$ Χ TrajectoryGenerate Make Cubic.vi uses cubic splines TrajectoryConfig config ) TrajectoryGenerate Make Generic.vi Helper to bring these all together..  $X \mid X$  $X \mid X$ Use this one!!! public static Trajectory generateTrajectory( ControlVectorList controlVectors, TrajectoryConfig config) TrajectoryGenerate\_Make\_Quintic\_CtrlVect.vi Χ uses quintic splines Х TrajectoryGenerate\_Make\_Quintic\_Weighted.vi New 2762  $X \mid X$  $X \mid X$ public static Trajectory generateTrajectory(List<Pose2d> waypoints, TrajectoryConfig config) TrajectoryGenerate Make Quintic.vi X uses quintic splines X Χ TrajectoryGenerate splinePointsFromSplines.vi public static List<PoseWithCurvature> X Χ splinePointsFromSplines(Spline[] splines) VI Name Function Prototype Notes public ControlVectorList(int initialCapacity) TRAJECTORY GENERATE (Control Vector) may not need, just data public ControlVectorList() may not need, just data public ControlVectorList(Collection<? extends may not need, just data Spline.ControlVector> collection) Function Prototype Notes TRAJECTORY PARAMETERIZE X TrajectoryParam calcStuffFwd.vi Χ X No Χ X No TrajectoryParam calcStuffRev.vi private static void enforceAccelerationLimits(boolean reverse, TrajectoryParam enforceAccel.vi Χ his routines needs to be changed List<TrajectoryConstraint> constraints, ConstrainedState state) vhen new constraints are added. X TrajectoryParam enforceVelocity.vi This routines needs to be changed TrajectoryParam timeParam.vi public static Trajectory X timeParameterizeTrajectory( List<PoseWithCurvature> points. List<TrajectoryConstraint> constraints, double startVelocityMetersPerSecond, double endVelocityMetersPerSecond, double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq. boolean reversed )

12023 – Added execute routines for state spa	ace si	m and	CITI						
					Pé				
					Execution Optimized		•		
					tin		'an		
	eq	ьe	В	_	õ	ue	ō, o		
	mplementea	Documented	WPILIB	Menu Item	on	Test Routine	Sample Program		
	шe	Ĕ	¥	77	inti	B	e/d		
	ηdι	၁၃	Not 1	eni	ě	est.	<u> </u>		
			Ž		<u> </u>	_ <u>~</u>		Function Prototype	Notes
DIFF DRIVE KINEMATIC CONSTRAINT	X	X		X			DiffDriveKinematicsConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d	
								poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X			DiffDriveKinematicsConstraint_getMinMaxAccel.vi	public MinMax	
	^	_ ^		^			Dilibriverinematics constraint_getivililiviaxAccel.vi	getMinMaxAccelerationMetersPerSecondSg(Pose2d poseMeters	
								getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X	SI		DiffDriveKinematicsConstraint_New.vi	public DifferentialDriveKinematicsConstraint(final	
								DifferentialDriveKinematics kinematics, double	
								maxSpeedMetersPerSecond)	
					7				
					zec				
					Ĭ.		E .		
	Ø	0			þt	(D)	gles		
	πe	ĭe.	9	4	0	ţi	Q		
	je.	λer	Ы	Ę.	ţį	no	9		
	len	ä	$\geq$	Þ	Ş	#	Jdu		
	mplemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes
DIFF DRIVE VOLTAGE CONSTRAINT	_	X	_ <	_ <b>≥</b>	Щ			public double getMaxVelocityMetersPerSecond(Pose2d	110163
DIFF DRIVE VOLTAGE CONSTRAINT	٨	^		^			Dilibrive voltageConstraint_getwaxvelocity.vi	public double getiviaxivelocityivietersPerSecond(Posezd poseMeters, double curvatureRadPerMeter, double	
								velocityMetersPerSecond)	
	X	X		X			DiffDriveVoltageConstraint_getMinMaxAccel.vi	public MinMax	
	•	``		^`				getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters,	
								double curvatureRadPerMeter, double velocityMetersPerSecond)	
_									
	X	X		X	SI		DiffDriveVoltageConstraint_New.vi	public	
								DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double	
								feedforward, DifferentialDriveKinematics kinematics, double	
L								maxVoltage)	
					Ø				
					ize		~		
					tim		ä		
	þ	p	m		å	e	B		
	nte	nte	Ħ	E	2	ij	Ä		
	ше	<i>a</i> e	Ē	#	ıtic	8	e/s		
	Implemented	n	Not WPILIB	nu	Execution Optimized	Test Routine	Sample Program		
	Ē	Documented	Ş	Menu Item	Ř	je Je	<sup>®</sup> VI Name	Function Prototype	Notes
ELLIPTICAL REGION CONSTRAINT	Χ	Χ		Χ			EllipRegionConstraint_getMaxVelocity.vi		
	Χ	Χ		Χ			EllipRegionConstraint_getMinMaxAccel.vi		
	X	X		X			EllipRegionConstraint IsPoseInRegion.vi		
	Χ	Χ		Χ			EllipRegionConstraint_New.vi		
L				-					
					Þ				
					ijŹĘ		2		
					Execution Optimized		'a'		
	pə.	eq	В	_	Ó	ne 1	Sample Progr		
	ent	∍nt	WPILIB	eш	00	įţ	ď.		
	ŭ	ŭ	₹	#	ntic	B	e/c		
	Implementea	Documented	<del>*</del>	Menu Item	ec	Test Routine	<del>K</del>		
		۵	Not	Ž	Щ	e			Notes
JERK CONSTRAINT	/		X				JerkConstraint_getMaxVelocity.vi		FUTURE
							JerkConstraint_getMinMaxAccel.vi	Routine exists, it is just a shell	FUTURE
	/		X				ochoonstant_getiiniiiaa tooti.vi		
	/		X		SI		JerkConstraint New.vi	Routine exists, it is just a shell	FUTURE
	/				SI			Routine exists, it is just a shell	FUTURE
	/							Routine exists, it is just a shell	FUTURE
	/						JerkConstraint_New.vi	Routine exists, it is just a shell	FUTURE
	/						JerkConstraint_New.vi	Routine exists, it is just a shell	FUTURE
	// 	pə		_		eu.	JerkConstraint_New.vi	Routine exists, it is just a shell	FUTURE
	) led	ented	X	me		utine	JerkConstraint_New.vi	Routine exists, it is just a shell	FUTURE
	/ /	mented	X	ı Item		Routine	JerkConstraint_New.vi	Routine exists, it is just a shell	FUTURE
	\	ocumented	X	anu Item		st Routine	JerkConstraint_New.vi	Routine exists, it is just a shell	FUTURE
	Implemented \	Documented		Menu Item	Execution Optimized	Test Routine	JerkConstraint_New.vi	Routine exists, it is just a shell	FUTURE  Notes
MAX VELOCITY CONSTRAINT	Χ	Χ	X	Χ	প্ৰ Execution Optimized	Test Routine	JerkConstraint_New.vi	Routine exists, it is just a shell	FUTURE
MAX VELOCITY CONSTRAINT		X	X	X	ଓ ଓ Execution Optimized	Test Routine	JerkConstraint_New.vi	Routine exists, it is just a shell	FUTURE
MAX VELOCITY CONSTRAINT	Χ	Χ	X	Χ	প্ৰ Execution Optimized	Test Routine	JerkConstraint_New.vi	Routine exists, it is just a shell	FUTURE
MAX VELOCITY CONSTRAINT	X	X	X	X	ଓ ଓ Execution Optimized	Test Routine	JerkConstraint_New.vi	Routine exists, it is just a shell	FUTURE

Implemented Documented Not WPILIB Menu Item	Execution Optimi Test Routine Sample Program	VI Name	Function Prototype	Notes
TRAJECTORY CONSTRAINT (Min Max) X X X		Constraint_MinMax_New.vi	Constraint_MinMax_New	
X X X	SI	Constraint_MinMax_NewMinMax.VI	Constraint_MinMax_New	

'======== UTILITY

'=========

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

iale sp	acc 311	iii aiiu	our		Optimized		am			
	Implemented	Documented	Not WPILIB	Menu Item	Execution	Test Routine	Sample Program	VI Name	Function Prototype	Notes
UTIL	Χ	Χ	Χ	Χ	SI			Util_ApproxEqual.vi		
	Χ	Χ	Χ	Χ				Util_Array_PoseWCurv_to_XY.vi		
	Χ	Χ	Χ	Χ	SI			Util_CalcDist.vi		
	Χ	Χ	Χ	Χ	SI			Util_GetLibraryVersion.vi		
	Χ	Χ	Χ	Χ	SI			Util_GetLibUsage.vi		
	Χ	X	X	X				Util_GetTime.vi		Once tested completely, this should be optimized!
	Χ	Χ	Χ	No	- 1			Util_GetTime_U32.vi		
	Χ	Χ	Χ	No	1			Util_GetTime_U64.vi		
	Χ	Χ	Χ	No	N/A			Util_LibraryGlobals.vi		Global Variables – no block diag.
	Χ	Χ	Χ	Χ				Util_Trajectory_Absolute_To_Relative.vi		
	Χ	Χ	Χ	Χ				Util_Trajectory_ReadFile.vi		
	Χ	Χ	Χ	Χ				Util_Trajectory_to_XY.vi		
	Χ	Χ	Χ	No				Util_Trajectory_WriteFile_Config.vi		internal
	Χ	Χ	Χ	No				Util_Trajectory_WriteFile_OneState.vi		internal
	Χ	Χ	Χ	Χ				Util_Trajectory_WriteFile_PathFinder.vi		
	Χ	Χ	Χ	No				Util_Trajectory_WriteFile_PathFinderConfig.vi		internal
	Χ	Χ	Χ	Χ				Util_Trajectory_WriteFile_Pathweaver.vi		
	Χ	Χ	Χ	No				Util_Trajectory_WriteFile_States.vi		internal
	Χ	Χ	Χ	No				Util_Trajectory_WriteFile_WayPoints.vi		internal
	Χ	Χ	Χ	Χ				Util_Trajectory_WriteFile.vi		
	Χ	Χ	Χ	Χ				Util_TrajectoryState_Meters_To_Inches.vi		
	Χ	Χ	Χ	Χ				Util_TrajState_to_DiffDrive_WheelPos.vi		
	Χ	Χ	Χ	Χ				Util_DispWaypoint_Eng_To_SI.vi		
	Χ	Χ	Χ	Χ				Util_DispWaypoint_To_CubicInput.vi		
	Χ	Χ	Χ	Χ				Util_DispWaypoint_To_QuinticInput.vi		
	Χ	Χ	Χ	Χ				Util_DispWeightedWaypiont_Eng_To_WeightedWaypoint		
	Χ	X	X	No				Util_DispWeightedWayPoint_To_WeightedWayPoint.vi		Sorry about the confusing name

CONVERSIONS '=======

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

-	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program		Function Prototype	Notes
CONV	Χ	Χ	Χ	Χ	SI			Conv_AngleDegrees_Heading.vi		
	X	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	Χ	Χ	SI			Conv_Kilograms_Pounds.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Meters_Feet.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Meters_Inches.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Pose2d_SI_Eng.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Pounds_Kilograms.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Radians_Deg.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Radians_Rotations.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Rotations_Deg.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Rotations_Radians.vi		
	Χ	Χ	X	X	SI			Conv_Yards_Meters.vi		

Page 22 / 40 FRC\_LabVIEW\_Trajectory\_Library\_Routines.xlsx

state spa	lemented	sumented B	WPILIB	nu Item	Execution Optimized	t Routine	nple Program			
	ПП	Ď	Not	Menu	Ĕ	Test	Sai	VI Name	Function Prototype	Notes
UNITS	Χ	Χ		X	SI			Units_DegreesToRadians.vi		
	Χ	Χ		X	SI			Units_DegreesToRotations.vi		
	Χ	Χ		X	SI			Units_FeetToMeters.vi		
	Χ	Χ		X	SI			Units_InchesToMeters.vi		
	Χ	Χ		X	SI			Units_MetersToFeet.vi		
	Χ	Χ		X	SI			Units_MetersToInches.vi		
	Χ	Χ		X	SI			Units_MillisecondsToSeconds.vi		
	Χ	Χ		X	SI			Units_RadiansPerSecondToRotationsPerMinute.vi		
	Χ	Χ		X	SI			Units_RadiansToDegrees.vi		
	Χ	Χ		X	SI			Units_RadiansToRotations.vi		
	Χ	Χ		X	SI			Units_RotationsPerMinuteToRadiansPerSecond.vi		
	Χ	Χ		X	SI			Units_RotationsToDegrees.vi		
	Χ	Χ		X	SI			Units_RotationsToRadians.vi		
	Χ	X		X	SI			Units_SecondsToMilliseconds.vi		

'======== PATHFINDER UTIL

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

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

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program Namel		Function Prototype	١	Notes	Code Review	Test Program	Error Checking	х
DC MOTOR		X		X	SI			or_GetAndymark9015.vi							Х
	Χ	X			SI			or_GetAndymarkAM2235A.vi							Х
	Χ	X		X	SI			or_GetAndymarkAM3493.vi							Х
	Χ	X		X	SI			or_GetAndymarkRs775_125.vi							Х
	Χ	X			SI		DCMoto	or_GetBag.vi							Х
	Χ	X		Χ	SI			r_GetBanebotsRs550.vi							Х
	Χ	X		X	SI			or_GetBanebotsRs775.vi							Х
	Χ	X			SI			or_GetClM.vi							Х
	Χ	X		X	SI			or_GetCurrent.vi							Х
	Χ	X		X	SI			or_GetFalcon500.vi							Х
	Χ	X			SI			or_GetMiniCIM.vi							Х
	Χ	X		X	SI			or_GetNEO.vi							Х
	Χ	X		X	SI			or_GetNEO550.vi							Х
	Χ	X			SI			or_GetRomiBuiltIn.vi							Х
	Χ	X		Χ	SI			or_GetSpeed.vi							Х
	Χ	X		Χ	SI			or_GetTorque.vi							Х
	Χ	X			SI			or_GetVex775Pro.vi							Х
	Χ	X		X	SI			or_New.vi							Х
	Χ	X		Χ	SI			r_PickMotor.vi							Х
	Χ	X		Χ	SI		DCMotor	or_WithReduction.vi							Х

					iized		,						
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optim	Test Routine	Sample Progran	VI Name	Function Prototype	Notes	Code Review	Test Program	Č
INEAR SYSTEM ID	Χ	Χ		Χ				LinearSystemId_CreateDCMotorSystem.vi					
	X	Χ		Χ				LinearSystemId_CreateDriveTrainVelocitySystem.vi		Update to use create matrix			ĺ
	X	Χ		Χ				LinearSystemId_CreateElevatorSystem.vi		Update to use create matrix			
	X	Χ		Χ				LinearSystemId_CreateFlywheelSystem.vi		Update to use create matrix			
	X	Χ		Χ				LinearSystemId_CreateSingleJointedArmSystem.vi		Update to use create matrix			
	X		Χ	Χ				LinearSystemId_DCMotor_Pack_Model_Params.vi					
	X		Χ	Χ				LinearSystemId_DiffDrv_ID_Pack_Model_Params.vi					
	X		Χ	Χ				LinearSystemId_DiffDrv_Pack_Model_Params.vi					
	X		Χ	Χ				LinearSystemId_Elevator_Pack_Model_Params.vi					
	X		Χ	Χ				LinearSystemId_FlyWheel_Pack_Model_Params.vi					Ĺ
	X	Χ		Χ				LinearSystemId_IdentifyDriveTrainSystem.vi		Update to use create matrix			ĺ
	X	Χ		Χ				LinearSystemId_IdentifyPositionSystem.vi		Update to use create matrix			
	X	Χ		Χ				LinearSystemId_IdentifyVelocitySystem.vi		Update to use create matrix			
	X		Χ	Χ				LinearSystemId_SngJntArm_Pack_Model_Params.vi					Ĺ
	1 1			- 1							1		1

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

=												
	Implemented	Documented	Vot WPILIB	Menu Item Frequition Ontimized	.≃	Sample Program	VI Name	Function Prototype	Notes	Sode Review	Test Program	Error Checking
DIFFERENTIAL DRIVE POSE ESTIMATOR		$\overline{X}$	$\overline{}$	$\overline{X}$		Τ,	DiffDrivePoseEst AddVisionMeasurement.vi				• •	
	X			X			DiffDrivePoseEst FillStateVector.vi					
				X			DiffDrivePoseEst GetEstimatedPosition.vi					
				X			DiffDrivePoseEst_Kalman_F_Callback.vi					
	X	X		X			DiffDrivePoseEst_Kalman_H_Callback.vi					
	X	X		X			DiffDrivePoseEst_New.vi					
	X	X		X			DiffDrivePoseEst_ResetPosition.vi					
				X			DiffDrivePoseEst_SetVisionMeasurementStdDevs.vi					
	X	X		X			DiffDrivePoseEst_Update.vi					
	Χ	X		X			DiffDrivePoseEst_UpdateWithTime.vi					
	Χ	X		Χ			DiffDrivePoseEst_VisionCorrect_Callback.vi					
	Χ	X		X			DiffDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi					
	Implemented		Not N	Menu Item	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE POSE ESTIMATOR 2	Χ			X			DiffDrivePoseEst2_AddVisionMeasurement.vi					
-	Χ			vo s	I		DiffDrivePoseEst2_BufferDuration.vi					
	Χ			Χ			DiffDrivePoseEst2_GetEstimatedPosition.vi					
				No			DiffDrivePoseEst2_InterpRecord_ExtractFromVar.vi					
	X			No			DiffDrivePoseEst2_InterpRecord_Interp.vi					
	X			No			DiffDrivePoseEst2_InterpRecord_New.vi					
	X			X			DiffDrivePoseEst2_New.vi					
,				X			DiffDrivePoseEst2_ResetPosition.vi					
,				X			DiffDrivePoseEst2_SetVisionMeasurementStdDevs.vi					
,	X	X		X			DiffDrivePoseEst2_Update.vi					
,	Χ	X		X			DiffDrivePoseEst2_UpdateWithTime.vi					
l												

	plemented	ot WPILIB	enu Item	xecution Optimiza	Test Routine Sample Program				ode Review	est Program	
EXTENDED KALMAN FILTER	ر کے اِر	ĭ <u>₹</u>	_ <u>≥</u>   <i>X</i>	Щ	N N	VI Name  ExtendedKalmanFilter Correct OnlyUY.vi	Function Prototype	Notes	<u> </u>	<u> </u>	
EXTENDED RALMANTIETER	$\frac{\lambda}{X}$	(	X			ExtendedKalmanFilter Correct.vi		Just a shell, not functional!			
	XX	(	X			ExtendedKalmanFilter_GetP_Single.vi		,			
	XX		X			ExtendedKalmanFilter_GetP.vi					
	X X		X			ExtendedKalmanFilter_GetXHat_Single.vi  ExtendedKalmanFilter GetXHat.vi					
	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$		X			ExtendedKalmanFilter New.vi					
	XX		Χ			ExtendedKalmanFilter_Predict.vi					
	XX		X			ExtendedKalmanFilter_Reset.vi					
	X X		X			ExtendedKalmanFilter_SetP.vi ExtendedKalmanFilter_SetXHat_Single.vi					
	$\frac{\hat{x}}{x}$		X			ExtendedKalmanFilter_SetXHat.vi					
	ented	ILIB	ш	on Optimized	Routine ole Program				eview	ogram	Saido
	eme	WPIL	u Ite	cutic					ď 0	Pro	ζ
	Idm	\ot	Menu	χe	Test Sam	VI Name	Function Prototype	Notes	20 <i>d</i>	rest	Č.
KALMAN FILTER	$\overline{x}$		X	F	X	KalmanFilter_Correct.vi		11000			
	XX	(	Χ			KalmanFilter_GetK					
	X X		X			KalmanFilter_GetK_Single.vi KalmanFilter GetXHat					
	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$		X		X	KalmanFilter_GetXHat_Single					
	XX	(	Χ		X	KalmanFilter_New.vi					
	XX		Χ		X	KalmanFilter_Predict.vi					
	XX		X			KalmanFilter_Reset.vi					
	X X		X		X	KalmanFilter_SetXHat KalmanFilter_SetXHat_Single					
(ALMAN FILTER LATENCY COMPENSATOR	X X Implemented	Not W	X Menu Item	Execution Optimized	Test Routine Sample Program	VI Name  KalmanFilterLatencyComp_AddObserverState.vi  KalmanFilterLatencyComp_ApplyPastGlobalMeas FuncGroup.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	XX		Χ			KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.vi					
	XX		X			KalmanFilterLatencyComp_FindClosestMeasurement.vi					
	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$				_	KalmanFilterLatencyComp Observer New.vi					
		.	X			KalmanFilterLatencyComp_Reset.vi					
	XX	(	X			KalmanFilterLatencyComp_New.vi KalmanFilterLatencyComp_Observer_New.vi KalmanFilterLatencyComp_Reset.vi					
	<i>X X X</i>	5   5 @	_	Optimized	ne ogram				.ew	am	
	ted X X	I.B		tion Optimized	outine e Program				Review	rogram	
	ted X X	WPILIB	ltem	ecution Optimized	st Routine mple Program				de Review	st Program	Č
	X X	t WPILIB		Execution Optimized	Test Routine Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	
MECANUM DRIVE POSE ESTIMATOR	Implemented   X   Y   Y   Y   Y   Y   Y   Y   Y   Y	Not WPILIB	Menu Item	Execution Optimized	Test Routine Sample Program	MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi	Function Prototype	Notes	Code Review	Test Program	Saidood O rorra
MECANUM DRIVE POSE ESTIMATOR	X   X   X   X   X   X   X   X   X   X	Not WPILIB	X Menu Item	Execution Optimized	Test Routine Sample Program	MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi MecaDrivePoseEst_AddVisionMeasurement.vi	Function Prototype	Notes	Code Review	Test Program	Tryor Obecking
MECANUM DRIVE POSE ESTIMATOR	X X X X X X X X X X X X X X X X X X X	Not WPILIB	X Wenu Item	Execution Optimized	Test Routine Sample Program	MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi MecaDrivePoseEst_AddVisionMeasurement.vi MecaDrivePoseEst_GetEstimatedPosition.vi	Function Prototype	Notes	Code Review	Test Program	Fror Checking
MECANUM DRIVE POSE ESTIMATOR	X X X X X X X X X X X X X X X X X X X	Not WPILIB	Wenu Item	Execution Optimized	Test Routine Sample Program	MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi MecaDrivePoseEst_AddVisionMeasurement.vi MecaDrivePoseEst_GetEstimatedPosition.vi MecaDrivePoseEst_Kalman_F_Callback.vi MecaDrivePoseEst_Kalman_H_Callback.vi	Function Prototype	Notes	Code Review	Test Program	Error Chacking
MECANUM DRIVE POSE ESTIMATOR	X X X X X X X X X X X X X X X X X X X	Not WPILIB	Wenu Item	Execution Optimized	Test Routine Sample Program	MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi MecaDrivePoseEst_AddVisionMeasurement.vi MecaDrivePoseEst_GetEstimatedPosition.vi MecaDrivePoseEst_Kalman_F_Callback.vi	Function Prototype	Notes	Code Review	Test Program	Error Chacking

	X	X	X		MecaDrivePoseEst_Update.vi					
	X	X	X		MecaDrivePoseEst_UpdateWithTime.vi					
	X	X	No		MecaDrivePoseEst_VisionCorrect_Callback.vi					
	X	<i>X</i>	No		MecaDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi					
	Implemented	Documented Not WPILIB	Menu Item	Execution Optimized	Sample Program  ample Program	Function Prototype	Notes	Code Review	Test Program	
MECANUM DRIVE POSE ESTIMATOR 2		1/	X	01	MecaDrivePoseEst2_AddVisionMeasurement.vi					
	X X X		NO X No		MecaDrivePoseEst2_BufferDuration.vi MecaDrivePoseEst2_GetEstimatedPosition.vi MecaDrivePoseEst2_InterpRecord_ExtractFromVar.vi					
	X		No No		MecaDrivePoseEst2_InterpRecord_Interp.vi  MecaDrivePoseEst2_InterpRecord_New.vi					+
	X		X		MecaDrivePoseEst2_Interprecord_New.vi					
	X		X		MecaDrivePoseEst2_ResetPosition.vi					
	X		X		MecaDrivePoseEst2_SetVisionMeasurementStdDevs.vi					
	X		X		MecaDrivePoseEst2_Update.vi MecaDrivePoseEst2_UpdateWithTime.vi					
					modelitor occeste_opadiovilarinio.vi					$^{+}$
										+
	lemented	:umented WPILIB	nu Item	cution Optin	t Routine			le Review	t Program	
SWERVE DRIVE POSE ESTIMATO	Implemented	Documented Not WPILIB	Menu Item	Execution Optin	A SwerveDrivePoseEst AddVisionMeasurement StdDev vi	Function Prototype	Notes	Code Review	Test Program	
SWERVE DRIVE POSE ESTIMATO	X	X	X	Execution	SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi	Function Prototype	Notes	Code Review	Test Program	
SWERVE DRIVE POSE ESTIMATO	X	X X	X	Execution	SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi	Function Prototype	Notes	Code Review	Test Program	
SWERVE DRIVE POSE ESTIMATO	X X X	X X X	X X X	Execution	SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_Kalman_F_Callback.vi	Function Prototype	Notes	Code Review	Test Program	
SWERVE DRIVE POSE ESTIMATO	X X X	X X	X	Execution	SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_Kalman_F_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_New.vi	Function Prototype	Notes	Code Review	Test Program	
SWERVE DRIVE POSE ESTIMATO	X X X X X	X X X X X	X X X X X	Execution	SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_Kalman_F_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_New.vi SwerveDrivePoseEst_ResetPosition.vi	Function Prototype	Notes	Code Review	Test Program	
SWERVE DRIVE POSE ESTIMATO	X X X X X X	X X X X X X	X X X X X X	Execution	SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_Kalman_F_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_New.vi SwerveDrivePoseEst_ResetPosition.vi SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi	Function Prototype	Notes	Code Review	Test Program	
SWERVE DRIVE POSE ESTIMATO	X X X X X X	X X X X X X X	X X X X X X X	Execution	SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_Kalman_F_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_New.vi SwerveDrivePoseEst_ResetPosition.vi SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi SwerveDrivePoseEst_Update.vi	Function Prototype	Notes	Code Review	Test Program	
SWERVE DRIVE POSE ESTIMATO	X X X X X X X X X	X	X X X X X X X X X X	Execution	SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_Kalman_F_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_New.vi SwerveDrivePoseEst_ResetPosition.vi SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi SwerveDrivePoseEst_Update.vi SwerveDrivePoseEst_UpdateWithTime.vi SwerveDrivePoseEst_VisionCorrect_Callback.vi	Function Prototype	Notes	Code Review	Test Program	
SWERVE DRIVE POSE ESTIMATO	X X X X X X X	X	X X X X X X X X	Execution	SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_Kalman_F_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_New.vi SwerveDrivePoseEst_ResetPosition.vi SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi SwerveDrivePoseEst_Update.vi SwerveDrivePoseEst_UpdateWithTime.vi	Function Prototype	Notes	Code Review	Test Program	
SWERVE DRIVE POSE ESTIMATO	X X X X X X X X X	X	X X X X X X X X X X	Execution	SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_Kalman_F_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_New.vi SwerveDrivePoseEst_ResetPosition.vi SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi SwerveDrivePoseEst_Update.vi SwerveDrivePoseEst_UpdateWithTime.vi SwerveDrivePoseEst_VisionCorrect_Callback.vi	Function Prototype	Notes	Code Review	Test Program	
SWERVE DRIVE POSE ESTIMATO	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Optimized	SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_Kalman_F_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_New.vi SwerveDrivePoseEst_ResetPosition.vi SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi SwerveDrivePoseEst_Update.vi SwerveDrivePoseEst_Update.vi SwerveDrivePoseEst_VisionCorrect_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi			de Review	st Program Test Program	
	X X X X X X X X X X X X X X X X X X X	X	X X X X X X X X X X X X X X X X X X X	ifimized	SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_Kalman_F_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_New.vi SwerveDrivePoseEst_ResetPosition.vi SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi SwerveDrivePoseEst_Update.vi SwerveDrivePoseEst_UpdateWithTime.vi SwerveDrivePoseEst_VisionCorrect_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi	Function Prototype  Function Prototype	Notes	Code Review Code Review	Test Program	
SWERVE DRIVE POSE ESTIMATOR 2	X X X X X X X X X X X X X X X X X X X	Documented X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Execution Optimized Execution	SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_Kalman_F_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_New.vi SwerveDrivePoseEst_ResetPosition.vi SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi SwerveDrivePoseEst_Update.vi SwerveDrivePoseEst_UpdateWithTime.vi SwerveDrivePoseEst_VisionCorrect_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi			de Review	Test Program	
	X X X X X X X X X X X X X X X X X X X	Documented X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Execution Optimized Execution	SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_Kalman_F_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_New.vi SwerveDrivePoseEst_ResetPosition.vi SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi SwerveDrivePoseEst_Update.vi SwerveDrivePoseEst_UpdateWithTime.vi SwerveDrivePoseEst_VisionCorrect_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi  ###################################			de Review	Test Program	
	X X X X X X X X X X X X X X X X X X X	Documented X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	So Execution Optimized	SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_Kalman_F_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_New.vi SwerveDrivePoseEst_ResetPosition.vi SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi SwerveDrivePoseEst_Update.vi SwerveDrivePoseEst_UpdateWithTime.vi SwerveDrivePoseEst_VisionCorrect_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi			de Review	Test Program	
	X X X X X X X X X X X X X X X X X X X	Documented X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Secution Optimized	SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_Kalman_F_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_New.vi SwerveDrivePoseEst_ResetPosition.vi SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi SwerveDrivePoseEst_Update.vi SwerveDrivePoseEst_UpdateWithTime.vi SwerveDrivePoseEst_VisionCorrect_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi  ### SwerveDrivePoseEst_BufferDuration.vi SwerveDrivePoseEst2_BufferDuration.vi SwerveDrivePoseEst2_GetEstimatedPosition.vi SwerveDrivePoseEst2_InterpRecord_ExtractFromVar.vi SwerveDrivePoseEst2_InterpRecord_Interp.vi			de Review	Test Program  Test Program	
	X X X X X X X X X X X X X X X X X X X	Documented X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Secution Optimized	SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_Kalman_F_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_New.vi SwerveDrivePoseEst_ResetPosition.vi SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi SwerveDrivePoseEst_Update.vi SwerveDrivePoseEst_Update.vi SwerveDrivePoseEst_VisionCorrect_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi  ### SwerveDrivePoseEst_Dupdate_VisionCorrect_Supplied_Callback.vi SwerveDrivePoseEst_VisionCorrect_Supplied_Callback.vi SwerveDrivePoseEst_Supplied_Callback.vi SwerveDrivePoseEst_Supplied_Callback.vi SwerveDrivePoseEst2_Enterprecord_ExtractFromVar.vi SwerveDrivePoseEst2_InterpRecord_Interp.vi SwerveDrivePoseEst2_InterpRecord_New.vi			de Review	Test Program	
	X	Documented X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Secution Optimized	SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_Kalman_F_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_New.vi SwerveDrivePoseEst_ResetPosition.vi SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi SwerveDrivePoseEst_Update.vi SwerveDrivePoseEst_Update.vi SwerveDrivePoseEst_VisionCorrect_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi  ### SwerveDrivePoseEst_BufferDuration.vi SwerveDrivePoseEst2_BufferDuration.vi SwerveDrivePoseEst2_GetEstimatedPosition.vi SwerveDrivePoseEst2_InterpRecord_ExtractFromVar.vi SwerveDrivePoseEst2_InterpRecord_Interp.vi SwerveDrivePoseEst2_InterpRecord_New.vi SwerveDrivePoseEst2_New.vi			de Review	Test Program	
	X X X X X X X X X X X X X X X X X X X	Documented X X X X X X X X X X X X X X X X X X X	X	Secution Optimized	SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_Kalman_F_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_New.vi SwerveDrivePoseEst_ResetPosition.vi SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi SwerveDrivePoseEst_Update.vi SwerveDrivePoseEst_Update.vi SwerveDrivePoseEst_VisionCorrect_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi  ### SwerveDrivePoseEst_DetEst_VisionCorrect_Sulman			de Review	Test Program  Test Program	
	X	Documented X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Secution Optimized	SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_Kalman_F_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_New.vi SwerveDrivePoseEst_ResetPosition.vi SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi SwerveDrivePoseEst_Update.vi SwerveDrivePoseEst_Update.vi SwerveDrivePoseEst_VisionCorrect_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi  ### SwerveDrivePoseEst_BufferDuration.vi SwerveDrivePoseEst2_BufferDuration.vi SwerveDrivePoseEst2_GetEstimatedPosition.vi SwerveDrivePoseEst2_InterpRecord_ExtractFromVar.vi SwerveDrivePoseEst2_InterpRecord_Interp.vi SwerveDrivePoseEst2_InterpRecord_New.vi SwerveDrivePoseEst2_New.vi			de Review	Test Program  Test Program	

sion 3.05 3/01/2023 – Added execute routines for state sp		and c	trl									
	uoc Siili	and C	uı	þ								
				ıize		2						
				tir		ran					_	β
	pə,	pə	В	ຼ່ຽ	ne	,00				e.	aπ	,ķ
	eni	ent	7	ten. tion	uti	ď				e.	lbo	þe
	em	Ĕ			Test Routine	e) di				Œ O	ą	Õ
	Jdι	000	ot	Menu Execu	est	am	Manua	Franchica Dactatura	Notes	o o	est	2
UNICOENTED KALMAN EU TED	. <del> </del>	<del>^</del>					Name	Function Prototype	Notes	- 0		Ш
UNSCENTED KALMAN FILTER				X			nscentedKalmanFilter_Correct_FuncGroup.vi					
	X	$\frac{x}{x}$		X		U	nscentedKalmanFilter_Correct_OnlyUY.vi					
	X	$\frac{x}{x}$		X	<del>                                     </del>		nscentedKalmanFilter_Correct_OnlyUYR.vi nscentedKalmanFilter Correct.vi					
	X			X X	<del>                                     </del>		nscentedKalmanFilter_Correct.vi nscentedKalmanFilter_GetP_Single.vi					
	X			X		11	nscentedKalmanFilter_GetP_Single.vi					
	X			X			nscentedKalmanFilter_GetXHat_Single.vi					
	X			X			nscentedKalmanFilter_GetXHat.vi					
	X	$\stackrel{\leftarrow}{\sim}$		X			nscentedKalmanFilter New Default.vi					
	X			X			nscentedKalmanFilter_New_FuncGroup.vi					
	X			X			nscentedKalmanFilter New.vi					
	X			X	_		nscentedKalmanFilter_Predict.vi					
	X			X			nscentedKalmanFilter Reset.vi					
	X			X	_		nscentedKalmanFilter_SetP.vi					
	X			X			nscentedKalmanFilter_SetXHat_Single.vi					
	X			X			nscentedKalmanFilter_SetXHat.vi					
	X			X	_		nscentedKalmanFilter Transform.vi					
			+			<del>                                      </del>						
•								<u> </u>	<u> </u>		•	
				pə								
				niż		E						
	Ø	75		pti	a)	gra				>	8	ing
	Jte.	μeα	9	0 3	tine	é				Χie	yraı	€C FC
	иe	ner	<u>[</u> .	∯ ġ	200	le l				Re	Ž	Š
	)ei	оспше	<b>₹</b>	Menu Iten Execution	Test Routine	ш				qe	st F	.o.
	Ψ	δ	Not WPIL.	Menu Iter Executior	<u>7</u> e	Sal ∨	Name	Function Prototype	Notes	Š	7e3	En
ONTROL AFFINE PLANT INVERSION FEEDFORWARD												
					<u> </u>							
				je d								
				mi		8						_
												cking
	Ø	75		pt	ø)	gra				×	8	
	nted	nted	91	m n Opti		Progra				view	gram	3CK
	nented	nented	PILIB	item tion		le Progra				Review	rogram	Check
	olemented	umer	71.	item tion		nple Progra				de Review	st Program	ğ
	mplemented	ocumer	Not WPILIB	item tion		₹.	Name	Function Prototype	Notes	Code Review	Test Program	ğ
DIFFERENTIAL DRIVE ACCELERATION LIMITER	Implemer	Documer	Not 2	Menu Item Execution	Test Routi	San	Name iffDrvAccelLimit Calculate.vi	Function Prototype	Notes	Code Review	Test Program	ğ
DIFFERENTIAL DRIVE ACCELERATION LIMITER	X Implemer	X Documer	Not	item tion	X Test Routi	IV San	ffDrvAccelLimit_Calculate.vi	Function Prototype	Notes	Code Review	Test Program	ğ
DIFFERENTIAL DRIVE ACCELERATION LIMITER	Implemer	X Documer	Not	X Menu Item Execution	Test Routi	IV San		Function Prototype	Notes	Code Review	Test Program	ğ
DIFFERENTIAL DRIVE ACCELERATION LIMITER	X Implemer	X Documer	Not	X Menu Item Execution	X Test Routi	IV San	ffDrvAccelLimit_Calculate.vi	Function Prototype	Notes	Code Review	Test Program	ğ
DIFFERENTIAL DRIVE ACCELERATION LIMITER	X Implemer	X Documer	Not	X Menu Item Execution	X Test Routi	IV San	ffDrvAccelLimit_Calculate.vi	Function Prototype	Notes	Code Review	Test Program	ğ
DIFFERENTIAL DRIVE ACCELERATION LIMITER	X Implemer	X Documer	Not	X Menu Item Execution	X X Test Routi	IV San	ffDrvAccelLimit_Calculate.vi	Function Prototype	Notes	N Code Review	m Test Program	ğ
DIFFERENTIAL DRIVE ACCELERATION LIMITER	X Implemer	X Documer	Not	X Menu Item Execution	X X Test Routi	IV San	ffDrvAccelLimit_Calculate.vi	Function Prototype	Notes	riew Code Review	ram Test Program	ğ
DIFFERENTIAL DRIVE ACCELERATION LIMITER	X Implemer	nented X X Documer	PILIB	X Menu Item Execution	X X Test Routi	IV San	ffDrvAccelLimit_Calculate.vi	Function Prototype	Notes	Review Code Review	rogram Test Program	ğ
DIFFERENTIAL DRIVE ACCELERATION LIMITER	X Implemer	umented X X Documer	PILIB	tion Optimized Execution	Routine X X Test Routi	IV San	ffDrvAccelLimit_Calculate.vi	Function Prototype	Notes	le Review Code Review	t Program Test Program	ğ
DIFFERENTIAL DRIVE ACCELERATION LIMITER	X Implemer	ocumented X X Documer	PILIB	tion Optimized Execution	Routine X X Test Routi	mple Program	iffDrvAccelLimit_Calculate.vi iffDrvAccelLimit_New.vi			ode Review Code Revi	Test Program  Test Program	ğ
	Implemented X X Implemer	Documented X X Documer	Not WPILIB Not	Menu Item X X Menu Item Execution Optimized	Test Routine X X Test Routi	Sample Program Sample Program	iffDrvAccelLimit_Calculate.vi iffDrvAccelLimit_New.vi  Name	Function Prototype  Function Prototype	Notes Notes	Code Review Code Review	Test Program Test Program	ğ
DIFFERENTIAL DRIVE ACCELERATION LIMITER	X Implemented X X Implemer	X Documented X X Documer	Not WPILIB	X Menu Item X X Menu Item Execution Optimized	X Test Routine X X Test Routi	Sample Program Sam	iffDrvAccelLimit_Calculate.vi iffDrvAccelLimit_New.vi  Name ipIModelFollow_Calculate.vi			ode Review Code Revi	Test Program Test Program	ğ
	X X Implemented X X Implemer	X Documented X X Documer	Not WPILIB	X X Menu Item X X Menu Item Execution Optimized	X X Test Routine X X Test Routi		iffDrvAccelLimit_Calculate.vi iffDrvAccelLimit_New.vi  Name ipIModelFollow_Calculate.vi ipIModelFollow_GetU.vi			ode Review Code Revi	Test Program Test Program	ğ
	X X Implemented X X Implemer	X Documented X X Documer	Not WPILIB	X X Menu Item X X Menu Item Execution Optimized	X X Test Routine X X Test Routi		iffDrvAccelLimit_Calculate.vi iffDrvAccelLimit_New.vi  Name ipIModelFollow_Calculate.vi ipIModelFollow_GetU.vi ipIModelFollow_GetU_Single.vi			ode Review Code Revi	Test Program Test Program	ğ
	X X Implemented X X Implemer	X X Documented X X X	Not WPILIB	X X Menu Item X X Menu Item Execution Optimized	X X X X X X Test Routine		IffDrvAccelLimit_Calculate.vi IffDrvAccelLimit_New.vi  Name InplModelFollow_Calculate.vi InplModelFollow_GetU.vi InplModelFollow_GetU_Single.vi InplModelFollow_New.vi			ode Review Code Revi	Test Program Test Program	ğ
	X X Implemented X X Implemer	X X Documented X X X X X X X X X X X X X X X X X X X	Not WPILIB	X X X Menu Item X X Menu Item Execution Optimized	X X Test Routine X X Test Routi		iffDrvAccelLimit_Calculate.vi iffDrvAccelLimit_New.vi  Name ipIModelFollow_Calculate.vi ipIModelFollow_GetU.vi ipIModelFollow_GetU_Single.vi			ode Review Code Revi	Test Program Test Program	ğ

	ited	ted	g,	n , Optimize	ine	rogram				/iew	ıram	
	прІетеп	ocumen	Vot WPILIB	vienu rien. Execution	Test Routine	ample F	VI Name	Function Proteins	Natos	Code Rev	Test Progr	
LINEAR PLANT INVERSION FEEDFORWARD	×	X		X W		_ \script{S}	LinearPIntInvFF Calculate NextR.vi	Function Prototype	Notes	<u> </u>		$\top$
	Χ	X	)	Y			LinearPIntInvFF_Calculate.vi					$\pm$
	X	X	)	Y			LinearPIntInvFF_GetR_Single.vi					I
	X			X			LinearPIntInvFF_GetR.vi					+
	X			Υ Υ			LinearPIntInvFF_GetUff_Single.vi LinearPIntInvFF_GetUff.vi					+
	X			X			LinearPIntInvFF New Plant.vi					+
	X	X	7	Y			LinearPIntInvFF_New.vi					
	X			Y			LinearPIntInvFF_Reset_Initial.vi					
	X	X		Υ			LinearPIntInvFF_Reset_Zero.vi					_
				eq								
				miz		Ē						
	þ	Ø		Opti	ø	gra				<u>&gt;</u>	E	
	ente	ente	3		Routine	Pro				evié	ogra	
	eme	ЭШг	WPILIB	Menu nem Execution	B	ple				Œ o	Progr	
	Jdμ	000	Vot	i ei	Test	Sam	VI Name	Function Prototype	Notes	Cod	Test	
LINEAR QUADRATIC REGULATOR	X	X		ζ Ψ		\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	LinearQuadraticRegulator Calculate NextR.vi	T different i fototype	Notes			$\top$
	X	X	)	Y			LinearQuadraticRegulator_Calculate.vi					
	X	X	,	Y			LinearQuadraticRegulator_GetK_Single.vi		NOT ORIGINAL			
	X	X		Υ	X		LinearQuadraticRegulator_GetK.vi LinearQuadraticRegulator_GetR_Single.vi					_
	X			X X			LinearQuadraticRegulator_GetR_Single.vi					+
	X	X		X			LinearQuadraticRegulator_GetU_Single.vi					+
	X	X	,	Y			LinearQuadraticRegulator_GetU.vi					
	X	X	)	Υ	X		LinearQuadraticRegulator_LatencyCompensate.vi		Routine exists, but it only has		ı	
	Y	X		X			LinearQuadraticRegulator_New_ELMS.vi		interger raise matrix to power.			+
	X	X		X			LinearQuadraticRegulator_New_N.vi					+
							LinearQuadraticRegulator_New_Raw.vi					
	X	X		X .	X		LinearQuadraticRegulator_New_SystemELMS.vi					_
	X	X		χ χ			LinearQuadraticRegulator_New.vi LinearQuadraticRegulator_Reset.vi					+
		<del>  ^  </del>		`			Ellical Quadration (egulator_nesset.vi					+
					-	-						
				zed								
				timi		'am						
	ted	ted	е,	္ဝိ	ine	rogi				ïew	ram	
	nen	neu	PIL.	iten tion	Rout	e D				3e	rog	
	oler	cnu	<i>y y</i>	n noe	st R	ldu				qe i	St P	
			8 5	ž ŭ	Je.		VI Name	Function Prototype	Notes	Cod		
LINEAR SYSTEM				X 1			LinearSystem_CalculateX.vi					$\perp$
	X	X		X I X SI			LinearSystem_CalculateY.vi LinearSystem GetA.vi					+
	X	$\frac{\lambda}{X}$		X SI			LinearSystem GetAElement.vi					+
	X		,	X SI			LinearSystem_GetB.vi					+
	X	X	,	X SI			LinearSystem_GetBElement.vi					
	X			X SI			LinearSystem_GetC.vi					$\perp$
	X			X SI			LinearSystem_GetCElement.vi					+
	X			X SI			LinearSystem_GetD.vi LinearSystem GetDElement.vi					+
		$\frac{\hat{x}}{x}$		X SI			LinearSystem New.vi					+
												_1

					ΊΖΕ	2						
	_	_			Optimized ne	ıran				>	2	i
	tea	ted	, 18			Prog				<i>і</i> еи	ran	-
	леп	теп	F F	rem.	out	e T				Ze,	709	į
	len	'n	Not WPILIB	2	it SC	npl				je f	# P	:
	du,	Doc	Not W	j G	Execution Test Routi	San	VI Name	Function Prototype	Notes	Ö	Tes	ı
LINEAR SYSTEM LOOP	$\overline{X}$	$\overline{X}$		X		T	LinearSystemLoop_ClampInput.vi					
	Χ	X	λ	X			LinearSystemLoop_Correct.vi					
	Χ		XX				LinearSystemLoop_DCMotor_Execute.vi					
	Χ		XX				LinearSystemLoop_DCMotor_Pack_Ctrl.vi					
	X		XX	X			LinearSystemLoop_DiffDrv_Execute.vi				ļ!	
	X		X X				LinearSystemLoop_DiffDrv_Pack_Ctrl.vi				<u> </u>	
	X		X X				LinearSystemLoop_Elevator_Execute.vi				$\vdash$	
	X		XXX				LinearSystemLoop_Elevator_Pack_Ctrl.vi LinearSystemLoop_Execute.vi				$\vdash$	
	$\frac{\lambda}{X}$	<del></del>	$\hat{x}$ $\hat{x}$	^ X			LinearSystemLoop_Execute.vi					
	X		XX	X			LinearSystemLoop_FlyWheel_Pack_Ctrl.vi					
	7.			Ì			LinearSystemLoop_GetClampFunction.vi					
	Χ	X	)	X			LinearSystemLoop_GetController.vi					
	Χ	X	λ	X			LinearSystemLoop_GetError_Single.vi					
	Χ			X			LinearSystemLoop_GetError.vi					
		X		X			LinearSystemLoop_GetFeedForward.vi					
	X			X			LinearSystemLoop_GetNextR_Single.vi				<u> </u>	
	X	X		X			LinearSystemLoop_GetNextR.vi				<u> </u>	
	X		— <del>                                     </del>	X X			LinearSystemLoop_GetObserver.vi LinearSystemLoop_GetU_Row.vi					
	X			X			LinearSystemLoop_GetU_Row.vi LinearSystemLoop_GetU.vi				$\vdash$	
	$\hat{X}$			X			LinearSystemLoop_GetXHat_Single.vi					
	X			X			LinearSystemLoop_GetXHat.vi					
				`			LinearSystemLoop_New_BBB					
							LinearSystemLoop_New_LinearSystem_ClampFunc					
	Χ			X			LinearSystemLoop_New_LinearSystem_ClampVal.vi					
	X			X			LinearSystemLoop_New.vi					
	X		XX				LinearSystemLoop_Pack_Ctrl_Params.vi				ļ	
	X		X	X			LinearSystemLoop_Predict.vi				<u> </u>	
	X	X	×	X			LinearSystemLoop_Reset.vi				$\vdash$	
		-	-+				LinearSystemLoop_SetClampFunction.vi LinearSystemLoop_SetNextR_Some.vi					
	X	X	<del></del>	X			LinearSystemLoop_SetNextR.vi					
		<del>  ^  </del>					LinearSystemLoop_SetXHat_Single.vi					
			-				LinearSystemLoop_SetXHat.vi					
	Χ		XX	X			LinearSystemLoop_SngJntArm_Execute.vi					
	Χ		XX	X			LinearSystemLoop_SngJntArm_Pack_Ctrl.VI					
					ΙΖΕ	_						
					## ##	am						
	pe.	pə	В		<u>e</u> Ĉ	ıbo.				ew	am	
	ent	ent	WPILIB			Ţ				evi	ngo.	
	em	йn	. WF	7 7	ecution st Rout	ρle				de R	ą	Ć
	ирі	8	Not WPILI	Jer.	-xec Test	Sam	VI Name	Function Prototype	Notes	Cod	is is	
LTV DIFFERENTIAL DRIVE CONTROLLER	X	_ <u>Q</u>			<u> </u>		LTVDiffDriveCtrl AtReference.vi	T different foliotype		0		
	X			X			LTVDiffDriveCtrl Calculate TrajState.vi					
	X			X			LTVDiffDriveCtrl_Calculate.vi					
	Χ		XX				LTVDiffDriveCtrl_Execute.vi					
		X	λ	X			LTVDiffDriveCtrl_New.vi					
	Χ		XX				LTVDiffDriveCtrl_Pack_Ctrl_Params.vi					
	X		XX				LTVDiffDriveCtrl_Pack_Model_Params.vi					<u> </u>
	X		XX				LTVDiffDriveCtrl_Pack_Tolerance.vi				<u> </u>	
	X	$\mid X \mid$	}	X			LTVDiffDriveCtrl_SetTolerance.vi					1
	$\hat{X}$		XX				LTVUnicycleCtrl Execute TrajState.vi				1	

Revision 3.05 3/01/2023 – Added execute routines for state space sim and ctrl Function Prototype Notes LTV UNICYCLE CONTROLLER X X LTVUnicycleCtrl\_AtReference.vi XX X X LTVUnicycleCtrl\_Calculate\_TrajState.vi LTVUnicycleCtrl Calculate.vi  $X \mid X \mid$ X LTVUnicycleCtrl\_Execute.vi X X X X X LTVUnicycleCtrl Execute TrajState.vi LTVUnicycleCtrl New.vi XX LTVUnicycleCtrl\_Pack\_Model\_Params.vi LTVUnicycleCtrl\_Pack\_Tolerance.vi  $X \mid X$ LTVUnicycleCtrl\_SetEnabled.vi XX X X LTVUnicycleCtrl SetTolerance.vi '======= STATE SPACE UTILITIES '======== Function Prototype Notes CALLBACK HELPER X X XX CallbackHelp MatrixMinus.vi X X X X CallbackHelp MatrixMult CoerceSizeB.vi CallbackHelp\_MatrixMult.vi  $X \mid X \mid X \mid X$ CallbackHelp MatrixPlus.vi X X X X Function Prototype Notes DISCRETIZATION X X Discretization\_DiscretizeA.vi XX Χ Χ Discretization DiscretizeAB.vi Discretization DiscretizeABTaylor.vi  $X \mid X$ Χ X XX Discretization DiscretizeAQ.vi X X XX Discretization DiscretizeAQTaylor.vi Χ Χ Discretization\_DiscretizeR.vi Function Prototype Notes STATE SPACE UTIL X X X No StateSpaceUtil Check Stabalizable.vi Internal routine StateSpaceUtil\_ClampInputMaxMagnitude.vi X Routine exists, it is just a shell  $X \mid X$ XX Χ StateSpaceUtil\_IsDetectable.vi X X X X X StateSpaceUtil IsStabalizable.vi StateSpaceUtil MakeCostMatrix.vi StateSpaceUtil MakeCovarianceMatrix.vi XX X Χ StateSpaceUtil MakeWhiteNoiseVector.vi  $X \mid X$ X XX StateSpaceUtil NomalizeInputVector.vi X StateSpaceUtil PoseTo3dVector.vi X StateSpaceUtil\_PoseTo4dVector.vi XX Х StateSpaceUtil PoseToVector.vi XX Х

Revision 3.05 3/01/2023 – Added execute routines for state space sim and ctrl

'====== SIMULATION

'======== Function Prototype BatterySim CalculateDefaultBatteryLoadedVoltage.vi BATTERY SIM X X X SI X SI BatterySim CalculateLoadedVoltage.vi XX BatterySim\_Execute.vi Function Prototype Notes DC MOTOR SIM X DCMotorSim\_Execute.vi DCMotorSim\_getAngularPositionRad.vi X DCMotorSim getAngularPositionRotations.vi XX Х DCMotorSim getAngularVelocityRadPerSec.vi XX X DCMotorSim\_getAngularVelocityRPM.vi DCMotorSim GetCurrentDrawAmps.vi XX X DCMotorSim New MOI.vi XX Χ X X DCMotorSim New Plant.vi XX DCMotorSim\_Pack\_Simulation\_Params.vi XX X DCMotorSim SetInputVoltage.vi DCMotorSim Update.vi  $X \mid X$ Χ VI Name Notes Function Prototype DIFFERENTIAL DRIVE TRAIN SIM X DiffDriveTrainSim ClampInput.vi Χ DiffDriveTrainSim\_CreateKitbotSim\_EstMass.vi XX Χ DiffDriveTrainSim CreateKitbotSim EstMassMOI.vi XX X DiffDriveTrainSim CreateKitbotSim.vi DiffDriveTrainSim Execute.vi  $X \mid X$ X X DiffDriveTrainSim GetCurrentDrawAmps.vi Χ DiffDriveTrainSim\_GetCurrentGearing.vi XX X X DiffDriveTrainSim\_GetDynamics.vi DiffDriveTrainSim\_GetHeading.vi XX Х DiffDriveTrainSim\_GetLeftCurrentDrawAmps.vi XX Χ XX DiffDriveTrainSim\_GetLeftPositionMeters.vi X XX DiffDriveTrainSim GetLeftVelocityMetersPerSecond.vi X DiffDriveTrainSim\_GetOutput\_Single.vi XX Χ DiffDriveTrainSim\_GetPose.vi XX Χ DiffDriveTrainSim\_GetRightCurrentDrawAmps.vi DiffDriveTrainSim\_GetRightPositionMeters.vi XX X DiffDriveTrainSim\_GetRightVelocityMetersPerSecond.vi X DiffDriveTrainSim GetState Single.vi XX X DiffDriveTrainSim\_GetState.vi X XX X DiffDriveTrainSim KitBotWheelSize.vi DiffDriveTrainSim New Mass MOI.vi  $X \mid X$ Χ DiffDriveTrainSim\_New.vi XX X XX DiffDriveTrainSim Pack Model Params.vi X X X DiffDriveTrainSim Pack Simulation Params.vi XX DiffDriveTrainSim\_SetCurrentGearing.vi XX X DiffDriveTrainSim SetInputs.vi  $X \mid X \mid$ X DiffDriveTrainSim SetPose.vi

Revision 3.05 3/01/2023 – Added execute routines for state space sim and ctrl XX DiffDriveTrainSim SetState.vi XX Χ DiffDriveTrainSim\_ToughBoxMiniGearRatio.vi DiffDriveTrainSim\_ToughBoxMiniMotor.vi XX Χ Χ DiffDriveTrainSim Update.vi Function Prototype Notes ELEVATOR SIM X XX ElevatorSim Execute.vi XX ElevatorSim GetCurrentDraw.vi XX ElevatorSim\_GetPositionMeters.vi X X ElevatorSim GetVelocityMetersPerSecond.vi XX ElevatorSim\_HasHitLowerLimit.vi ElevatorSim HasHitUpperLimit.vi XX X ElevatorSim New LinSys NoNoise.vi ElevatorSim\_New\_LinSys.vi ElevatorSim New NoNoise.vi ElevatorSim New.vi X X ElevatorSim Pack Simulation Params.vi X X X No ElevatorSim\_RKF45\_Func.vi ElevatorSim\_SetInputVoltage.vi X XX ElevatorSim SetState.vi X X X X ElevatorSim Update.vi Needed because this doesn't ElevatorSim UpdateX.vi X X XX ElevatorSim WouldHitLowerLimit.vi XX ElevatorSim WouldHitUpperLimit.vi Function Prototype Notes FLYWHEEL SIM X X FlyWheelSim Execute.vi FlyWheelSim\_GetAngularVelocityRadPerSec.vi Χ X FlyWheelSim GetAngularVelocityRPM.vi XX X FlyWheelSim GetCurrentDrawAmps FlyWheelSim New LinSys Future FlyWheelSim New LinSys MOI NoNoise Future FlyWheelSim\_New\_LinSys\_NoNoise Future XX FlyWheelSim New MOI.vi FlyWheelSim\_Pack\_Simulation\_Params.vi XX Χ FlyWheelSim SetInput.vi XX X FlyWheelSim SetState.vi XX X FlyWheelSim\_Update.vi Function Prototype VI Name Notes LINEAR SYSTEM SIM X X LinearSystemSim ClampInput.vi X LinearSystemSim GetCurrentDrawAmps.vi DONT IMPLEMENT... XX LinearSystemSim\_GetOutput\_Single.vi X  $X \mid X$ Χ LinearSystemSim GetOutput.vi LinearSystemSim\_New XX Χ LinearSystemSim New NoNoise.vi LinearSystemSim SetInput Array.vi Doesn't use clamp? XX Χ LinearSystemSim\_SetInput\_Single.vi XX Χ LinearSystemSim SetInput.vi LinearSystemSim\_Setstate.vi XX X

Revision 3.05 3/01/2023 – Added execute routines for state space sim and ctrl XX LinearSystemSim\_Update.vi X X No LinearSystemSim\_UpdateX.vi LinearSystemSim\_UpdateY.vi X X X No VI Name Function Prototype Notes SINGLE JOINT ARM SIM X X SngJntArmSim EsitmateMOI.vi X X X SngJntArmSim Execute.vi XX SngJntArmSim\_GetAngleRads.vi X X X X SngJntArmSim\_GetCurrentDraw.vi X SngJntArmSim\_GetVelocityRadsPerSec.vi X X X X X Χ SngJntArmSim HasHitLowerLimit.vi SngJntArmSim\_HasHitUpperLimit.vi X X Х SngJntArmSim\_New.vi X X X SngJntArmSim Pack Simulation Params.vi SngJntArmSim Rkf45 Func.vi XX No X X X X SngJntArmSim\_SetInputVoltage.vi X X SngJntArmSim SetState.vi XX SngJntArmSim\_Update.vi XX X SngJntArmSim\_UpdateX.vi SngJntArmSim\_WouldHitLowerLimit.vi XX Χ SngJntArmSim\_WouldHitUpperLimit.vi  $X \mid X$ Χ '======== MATRIX UTILITIES VI Name Function Prototype Notes MAT BUILDER X X MatBuilder Create.vi X SI X SI XX MatBuilder Fill.vi Function Prototype Notes MATRIX XX X SI Matrix AssignBlock.vi Matrix\_Block.vi  $X \mid X$ X SI Matrix\_ChangeBoundsUnchecked.vi Matrix Create.vi Matrix Det.vi XX X SI Matrix\_Diag.vi Matrix\_Div\_Scalar.vi labview has function Matrix ElementPower.vi XX X SI Matrix\_ElementSum.vi Matrix ElementTimes.vi Matrix Equals.vi Matrix\_Exp.vi XX X I X SI X SI X X Matrix ExtractColumnVector.vi Matrix\_ExtractFrom.vi  $X \mid X$ Matrix ExtractMatrix.vi Matrix\_ExtractRowVector.vi XX X SI XX X SI Matrix Fill.vi Matrix Get.vi labview has function Х WPILIB calls this EYE Matrix Ident.vi Matrix Inv.vi

WPILib LabVIEW Math Library – VI Implementation List Revision 3.05 3/01/2023 – Added execute routines for state space sim and ctrl XX X SI Matrix\_IsEqual.vi Matrix\_IsIdentical.vi XX Matrix LLTDecompose.vi Matrix Max.vi Matrix MaxAbs.vi Matrix Mean.vi Matrix MinInternal.vi Matrix Minus Matrix.vi Matrix\_Minus\_Scalar.vi XX XI Matrix NormF.vi Matrix NormIndP1.vi Matrix\_Plus\_Matrix.vi Matrix Plus Scalar.vi Matrix Pow.vi THIS NEEDS WORK!!!! XX X SI Matrix SetColumn.vi THERE ARE LOTS OF OTHER MATRIX FUNCTIONS THAT XX X SI Matrix\_SetRow.vi SHOULD BE INCLUDED HERE FOR ISOLATION. Matrix Solve.vi Matrix Times Matrix.vi Matrix\_Times\_Scalar.vi Matrix Trace.vi X X X SI Matrix\_Transpose.vi X X X X Matrix WithinTolerance.vi Function Prototype SIMPLE MATRIX X SimpleMatrix ExtractMatrix.vi NOTE Matrix also has an X ExtractMatrix with different calling parameters.... YUK. Function Prototype Notes 
 MATRIX HELPER
 X
 X
 X
 X
 SI

 X
 X
 X
 X
 SI
 MatrixHelper CooerceSize.vi MatrixHelper\_MultCooerceBSize.vi X X X X SI MatrixHelper\_Zero.vi Function Prototype Notes VECTOR BUILDER X X X SI X SI VecBuilder 1x1Fill.vi XX VecBuilder 2x1Fill.vi XX X SI VecBuilder 3x1Fill.vi XX VecBuilder 4x1Fill.vi X SI X X X X X SI VecBuilder 5x1Fill.vi VecBuilder\_6x1Fill.vi XX X SI VecBuilder 7x1Fill.vi XX X SI VecBuilder 8x1Fill.vi

> VecBuilder 9x1Fill.vi VecBuilder\_10x1Fill.vi VecBuilder\_ArrayBy1Fill.vi

X X X X SI

WPILib LabVIEW Math Library – VI Implementation Lis Revision 3.05 3/01/2023 – Added execute routines for state sp	t	ı			_				
VECTOR	Implemented Documented Not WPILIB	Menu Item	© © Execution Optimized Test Routine	VI Name Vector_Dot.vi Vector_Norm.vi	Function Prototype	Notes	Code Review	Test Program	x x x x x x x x x x x x x x x x x x x
 MATH '======									x x x
ANGLE STATISTICS	X X Implemented X Documented X Not WPILIB	We X	X Execution Optimized X Test Routine	VI Name  AngleStats_AngleAdd_CallbackHelp.vi  AngleStats_AngleAdd.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking x x x
	X X X X X	( X	X	AngleStats_AngleMean_CallbackHelp.vi AngleStats_AngleMean.vi AngleStats_AngleResidual_CallbackHelp.vi					x x
	XXX	X	I X	AngleStats_AngleResidual.vi					x x x
MATH UTILITY	X X X X X X X X X X X X X X X X X X X	X Wenu Item	SI SI SI	Windows Window Windows Windows Windows Windows Windows Windows Windows Windows	Function Prototype	Notes	Code Review	Test Program	x x x x x x x x x x x x x x x x x x x
MERWE SCALED SIGMA POINTS	X X X X X X X X X X X X X X X X X X X	X	SI SI SI I I I I I I I I I I I I I I I	WorkescsigPts_ComputeWeights.vi MerweScSigPts_GetNumSigmas.vi MerweScSigPts_GetWc_Single.vi MerweScSigPts_GetWc.vi MerweScSigPts_GetWm_Single.vi MerweScSigPts_GetWm_Single.vi MerweScSigPts_GetWm.vi MerweScSigPts_New_Default.vi MerweScSigPts_New.vi	Function Prototype	Notes	Code Review	Test Program	x x x x x x x x x x x x x x x x x x x
	Mocumented X  Not WPILIB	X		MerweScSigPts_SigmaPoints.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking x x x x

NUMERICAL INTEGRATION X	'   X				NumIntegrate_Func_Ax_Bu_K.vi		NOT USED. Should this be used			
¥	'	.   1	X	'	Nullilitegrate_FullC_AX_Bu_K.VI		or abandoned???			
	<i>X</i>		Χ		NumIntegrate_Rk4_Dbl_X_U.vi					
X	X		Χ		NumIntegrate_Rk4_Dbl_X.vi					
X		:;	Χ		NumIntegrate_Rk4_Mat_X_U.vi					
X			X		NumIntegrate_Rk4_Mat_X.vi					
X		^	Vo 3	SI	NumIntegrate_Rkdp_Func_A.vi					
X	<i>X</i>	^	Vo 3	SI	NumIntegrate_Rkdp_Func_B1.vi					
X			Vo 3		NumIntegrate_Rkdp_Func_B1B2.vi					
X	<i>X</i>		Vo 3		NumIntegrate_Rkdp_Func_B2.vi					
X	' X	^	Vo	1	Numintegrate_Rkdp_Impl.vi		N 1 1 15 DISEAS			
X			X	01	NumIntegrate_RKDP_Mat_X_U.vi NumIntegrate_Rkf45_Func_A.vi		New replacement for RKF45			
X	X	<u>^</u>	Vo S	SI						
X		^	Vo 3	SI	NumIntegrate Rkf45 Func B1.vi					
X			Vo 3	SI	NumIntegrate_Rkf45_Func_B1B2.vi NumIntegrate_Rkf45_Func_B2.vi					
^	+^		10	31	NumIntegrate_RKf45_Func_Bs.vi		Removed. Replaced with newer			
					Nullilitegrate_KKI45_FullC_bs.VI		functions.			
					NumIntegrate_RKf45_Func_Ch.vi		Removed. Replaced with newer			
							functions.			
					NumIntegrate_RKf45_Func_Ct.vi		Removed. Replaced with newer			
<u>.</u>				,	Number and Different Comments and Comments a		functions.			
X			Vo V	1	NumIntegrate_Rkf45_Impl.vi		Mara de 102 e 11 20 11			
X	' X	,   '	X		NumIntegrate_Rkf45_Mat_X_U.vi		Note that this Feinberg method has been changed and a Dormand			
	'		/				Price method has been			
	'		/				implemented TODO			
					NumIntegrate_RKf45_New.vi		Removed. Never used.			
	X	X	X	SI	NumIntegrate_Trap_Dbl.vi					
X	X	X	X	1	NumIntegrate_Trap_Mat.vi					
DINICE ANT A TIME VARYING		Not WPILIB		Execution Optimized	None Note to the N	Function Prototype	Notes	Code Revien	Test Program	Error Checking
RUNGE KUTTA TIME VARYING X	X		No		RungeKuttaTimeVarying_RK4_Mat_T_Y.vi					
NUMERICAL JACOBIAN X X	Doo	)	X Menu Item	Execution Optimized	NumJacobian_X.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
NUMERICAL JACOBIAN X X Implemented RICCATI X	Documented X X Doc	Not WPILIB	X X	otimized	VI Name  NumJacobian_U.vi  NumJacobian_X.vi  Riccati_Check_Detectable.vi  Riccati_Check_Stabilizable.vi	Function Prototype  Function Prototype	Notes Routine exists, it is just a shell Not really done !!!	(D)		
NUMERICAL JACOBIAN X    mblemented	X Documented	Not WPILIB	X Wenu Item	otimized	VI Name    NumJacobian_U.vi     NumJacobian_X.vi     NumJacobian_X.vi     VI Name     Riccati_Check_Detectable.vi		Notes Routine exists, it is just a shell Not really done !!! Intended to allow DARE method	Review Code	Test	Checking
NUMERICAL JACOBIAN X    mblemented	X X Documented	X Not WPILIB	X X Wenu Item	Execution Optimized	VI Name    NumJacobian_U.vi     NumJacobian_X.vi     NumJacobian_X.vi     VI Name     Riccati_Check_Detectable.vi     Riccati_Check_Stabilizable.vi     Riccati_DARE_Choose.vi     X Riccati_DARE   Iterate.vi		Notes Routine exists, it is just a shell Not really done !!!	Review Code	Test	Checking
NUMERICAL JACOBIAN X X  RICCATI X X	X X Documented	X X X	X X X X X X X X X X X X X X X X X X X	Execution Optimized	VI Name    NumJacobian_U.vi     NumJacobian_X.vi     NumJacobian_X.vi     VI Name     Riccati_Check_Detectable.vi     Riccati_Check_Stabilizable.vi     Riccati_DARE_Choose.vi     X Riccati_DARE   Iterate.vi		Notes Routine exists, it is just a shell Not really done !!! Intended to allow DARE method	Review Code	Test	Checking
NUMERICAL JACOBIAN X X  papunamaldmi X X  RICCATI X X	X X Documented	X X X	X X X X X X X X X X X X X X X X X X X	Execution Optimized	VI Name    NumJacobian_U.vi     NumJacobian_X.vi     NumJacobian_X.vi     VI Name     Riccati_Check_Detectable.vi     Riccati_Check_Stabilizable.vi     Riccati_DARE_Choose.vi     X Riccati_DARE_Iterate.vi     X Riccati_DARE_StructDoubling.vi		Notes Routine exists, it is just a shell Not really done !!! Intended to allow DARE method	Review Code	Test	Checking
NUMERICAL JACOBIAN X  X  populae and the second of the sec	X X Documented	Not WPILIB	X X X X X X X X X X X X X X X X X X X	Execution Optimized	VI Name    NumJacobian_U.vi     NumJacobian_X.vi     NumJacobian_X.vi     VI Name     Riccati_Check_Detectable.vi     Riccati_Check_Stabilizable.vi     Riccati_DARE_Choose.vi     X Riccati_DARE_Iterate.vi     X Riccati_DARE_StructDoubling.vi     Riccati_DARE_N.vi		Notes Routine exists, it is just a shell Not really done !!! Intended to allow DARE method	Review Code	Test	Checking
NUMERICAL JACOBIAN X  X  Polyungungungungungungungungungungungungungu	X X Documented	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Execution Optimized	VI Name    NumJacobian_U.vi     NumJacobian_X.vi     NumJacobian_X.vi     VI Name     Riccati_Check_Detectable.vi     Riccati_Check_Stabilizable.vi     Riccati_DARE_Choose.vi     X Riccati_DARE_Iterate.vi     X Riccati_DARE_StructDoubling.vi		Notes Routine exists, it is just a shell Not really done !!! Intended to allow DARE method	Review Code	Test	Checking

'========

VISION

COMPONENTE SET INDICATE TO SET	VI Name  CompVisionUtil_CalculateDistanceToTarget.vi CompVisionUtil_EstimateCameraToTarget.vi CompVisionUtil_EstimateFieldToCamera.vi CompVisionUtil_EstimateFieldToRobot.vi CompVisionUtil_EstimateFieldToRobot_Alt.vi CompVisionUtil_ObjectToRobotPose.vi	Function Prototype	Notes	Code Review	Test Program  Error Checking
Abull tem  Not WPILIB  Test Routine	VI Name AprilTag_Equals.vi AprilTag_GetAll.vi AprilTag_New.vi	Function Prototype	Notes	Code Review	Test Program Error Checking
APRIL TAG FIELD LAYOUT    X	VI Name  AprilTagFieldLayout_GetField.vi AprilTagFieldLayout_GetOriginPosition.vi AprilTagFieldLayout_GetTagPose.vi AprilTagFieldLayout_GetTags.vi AprilTagFieldLayout_New.vi AprilTagFieldLayout_New2022.vi AprilTagFieldLayout_New2023.vi AprilTagFieldLayout_NewSelect.vi AprilTagFieldLayout_NewSelect.vi AprilTagFieldLayout_SetOrigin.vi AprilTagFieldLayout_SetOrigin_Position.vi	Function Prototype	Notes	Code Review	Test Program  Frror Checking
	VI Name  AprilTagPoseEstimate_GetAll.vi  AprilTagPoseEstimate_GetAmbiguity.vi  AprilTagPoseEstimate_New.vi	Function Prototype	Notes	Code Review	Test Program Error Checking

'========

COMMUNICATIONS

'=======

routines for state spa	ace sii	m and	ctrl									
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
NETWORK UDP	X	X	X	X	SI		NetworkUDP_Close.vi					
	Χ	Χ	Χ	Χ	1		NetworkUDP_Receive.vi					
	X	Χ	Χ	Χ	1		NetworkUDP_Send.vi					

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

_	Implemented	Documented	Not WPILIB	Menu Item	Execution Op Test Routine	Ample All Name	Function Prototype	Notes
TypeDef	Ζ	Ζ	Χ	Χ	N/A	AprilTag.ctl		
	Ζ	Ζ	Χ	Χ	N/A	AprilTagFieldLayout,ctl		
	Ζ	Ζ	Χ		N/A	AprilTagFieldLayoutOriginPosition_ENUM.ctl		
	Ζ	Ζ	Χ		N/A	AprilTagFields_ENUM.ctl		
	Ζ	Ζ	Χ		N/A	AprilTagPoseEstimate.ctl		
	Ζ	Ζ			N/A	ARM_FF.CTL		
	Ζ	Ζ		Χ	N/A	BANG_BANG.CTL		
	I		X		N/A	BICon-Matrix_FUNC_TYPE.CTL		NOT USED. Should this be deleted or abandoned???
	Ζ	Ζ		Χ		CALLBACK_FUNC_TYPE.CTL		
	Ζ	Ζ			N/A	CHASSIS_SPEEDS.CTL		
	Ζ	Ζ	Χ	Χ		CONTRAINED_STATE.CTL		
	Ζ	Ζ			N/A	COORDINATE_AXIS.CTL		
	Ζ	Ζ		Χ	N/A	COORDINATE_SYSTEM.CTL		
	Ζ	Ζ	Χ	Χ	N/A	DCMOTOR_SIM.CTL		
	/		/		/	DCMOTOR_SIM_MODEL_PARAMS.CTL		OBSOLETE – Removed
	Ζ			Χ		DCMOTOR_SIM_SIMULATION_PARAMS.CTL		
	Ζ	Ζ	Χ		N/A	DCMOTOR_TYPES_ENUM.CTL		
	Ζ	Ζ		Χ		DCMOTOR.CTL		
	Ζ	Z			N/A	DEBOUNCER_TYPE_ENUM.Ctl		
	Ζ	Z	Χ	X	N/A	DEBOUNCER.CTL		
	Z	<u> </u>	X	X	N/A	DIFF_DRIVE_ACCEL_LIMIT.CTL		
	Z	Z	X	X	N/A	DIFF_DRIVE_KINEMATICS.CTL		
	Z	Z	X		N/A	DIFF_DRIVE_Kitbot_WheelSize_ENUM.ctl		
	Z	Z	X		N/A	DIFF_DRIVE_ODOM2.ctl		
	Z	Ζ			N/A	DIFF_DRIVE_Pose_EST.ctl		
	Z				N/A	DIFF_DRIVE_POSE_EST2.ctl		
	Z				N/A	DIFF_DRIVE_POSE_EST2_INTERP_RECORD.CTL		
	Z	Z	X		N/A	DIFF_DRIVE_ToughBoxMini_GearChoice_ENUM.ctl		
	Z	Ζ	X	X	N/A	DIFF_DRIVE_ToughBoxMini_MotorChoice_ENUM.ctl		
	Z			X	N/A	DIFF_DRIVE_SIM_MODEL_PARAMS		
	Z				N/A	DIFF_DRIVE_SIM_SIMULATION_PARAMS.CTL		
-	Z	Z	X		N/A	DIFF_DRIVE_TRAIN_SIM_STATE_ENUM.CTL		
-	Z	Z	X	X	N/A	DIFF_DRIVE_TRAIN_SIM.ctl		NAC LITH NACAN/DOINT VI
-	Z	<u>Z</u>	X		NA	DISPLAY_WAYPOINT.ctl		Was UTIL_WAYPOINT.VI
	Ζ	Ζ	X	X	NA	DISPLAY_WEIGHTED_WAYPOINT.ctl		New V1.5. was UTIL_WEIGHTED_WAYPOINIT.VI
	Ζ	Ζ			N/A	ELEV_FF.CTL		
	Ζ	Ζ	Χ	X	N/A	ELEVATOR_SIM.CTL		
	Ζ				N/A	ELEVATOR_SIM_SIMULATION_PARAMS.CTL		
	Ζ	Ζ	Χ		N/A	EXTENDED_KALMAN_CORRECT_FUNC_GROUP.CTL		
	Ζ		Χ		N/A	EXTENDED_KALMAN_FILTER.CTL		
	Ζ	Ζ	Χ	X	N/A	FLYWHEEL_SIM.ctl		
Ī	Z		Z	X	N/A	FLYWHEEL_SIM_SIMULATION_PARAMS.CTL		
	Ζ	Ζ			N/A	FUNCTION_GENERATOR_MATRIX.ctl		
	Z	Z	Χ	X	N/A	FUNCTION_GENERATOR.ctl		

space sir	m and	ctrl				
	Z		X	Λ1/Λ	HOLONOMIC DRV CTRL.CTL	New 1/26/21
		X			KALMAN FILTER LATENCY COMP FUNC GROUP.CTL	146W 1/20/21
Z	Z		X			
Z	Z	X	X		KALMAN_FILTER_LATENCY_COMP.CTL	
Z	<u>Z</u>	X	X		KALMAN_FILTER.ctl	
Z	Z	Χ		N/A	LINEAR_FILTER.CTL	
Z	Ζ	Χ		N/A	LINEAR_PLANT_INV_FF.ctl	
Z	Ζ	X		N/A	LINEAR_QUADRATIC_REGULATOR.ctl	
Z		Ζ		N/A	LINEAR_SYSTEM_ID_DCMOTOR_MODEL.CTL	
Ζ		Ζ	X	N/A	LINEAR_SYSTEM_ID_ELEVATOR_MODEL.CTL	
Z		Ζ	X	N/A	LINEAR_SYSTEM_ID_FLYWHEEL_MODEL.CTL	
Z		Ζ	X	N/A	LINEAR_SYSTEM_ID_SINGLE_JOINT_ARM_MODEL.CTL	
Z	Ζ	Χ	X	N/A	LINEAR SYSTEM LOOP.ctl	
Z		Ζ	X	N/A	LINEAR SYSTEM LOOP CTRL PARAMS.CTL	
Z		Z	X	N/A	LINEAR SYSTEM LOOP DCMOTOR CTRL PARAMS.CL	
Z		Z	Χ	N/A	LINEAR SYSTEM LOOP DIFF DRV CTRL PARAMS.CTL	
Z		Ζ		N/A	LINEAR SYSTEM LOOP ELEVATOR CTRL PARAMS.CTL	
Z				N/A	LINEAR SYSTEM LOOP FLYWHEEL CTRL PARAMS.CTL	
Z			X		LINEAR SYSTEM LOOP SNGJNTARM CTRL PARAMS.CTL	
Z	Z	$\overline{X}$	X		LINEAR SYSTEM SIM.ctl	
Z	Z	X			LINEAR SYSTEM.ctl	
Z		$\overline{z}$		N/A	LTV DIFF DRIVE CTRL CONTROL PARAMS.CTL	
Z		Z		N/A	LTV DIFF DRIVE CTRL MODEL PARAMS.CTL	
	7			N/A	LTV_DIFF_DRIVE_CTRL_MODEL_FARAMS.CTL  LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl	
Z	Z	X				
Z	-	Z		N/A	LTV_DIFF_DRIVE_CTRL_TOLERANCE.CTL	
Z	Ζ	<u> </u>	X		LTV_DIFF_DRIVE_CTRL.ctl	
Z		Ζ		N/A	LTV_UNICYCLE_CONTROLLER_MODEL_PARAMS.CTL	
Z	Ζ	X		N/A	LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl	
Z		Ζ		N/A	LTV_UNICYCLE_CONTROLLER_TOLERANCE.CTL	
Z	Ζ	Χ		N/A	LTV_UNICYCLE_CONTROLLER.CTL	
Z	Ζ	Χ	X		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		Χ	X	N/A	MECA DRIVE POSE EST2.ctl	
Z		Χ	Χ	N/A	MECA DRIVE POSE EST2 INTERP RECORD.CTL	
Z	Ζ	Χ	Χ	N/A	MECA WHEEL POSITIONS.CTL	
Z	Ζ	Χ		N/A	MECA WHEEL SPEEDS.CTL	
Z	Ζ	Χ		N/A	MEDIAN FILTER.CTL	
Z	Ζ	Χ		N/A	MERWE SCALED SIGMA PTS.ctl	
Z	Z	X	X	N/A	OBSERVER SNAP LIST ITEM.CTL	
Z	Z	X		N/A	OBSERVER SNAPSHOT.CTL	
Z	Z	$\overline{X}$		N/A	PARAM STACK ITEM.CTL	
Z	Z	X	X		PARAM STACK.CTL	
Z	Z	X		N/A	PID ADV LIMITS.CTL	
Z	Z	X		N/A	PID_ADV_EINITIO.OTE PID_ADV_TUNING.CTL	
Z	Z	$\hat{x}$	X		PID CONTROLLER.CTL	
			X		_ ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` `	
Z					PID_ERROR_TOLERANCE.CTL	
Z			X		PID_INPUT_LIMITS.CTL	
Z	Z		X		PID_TUNING.CTL	
Z	<u> </u>		X		POSE2D.CTL	
Z	Z				POSE3D.CTL	
Z	Z	X	X		POSEWCURVATURE.CTL	
Z	Z	X	X		PROFILED_PID_CONTROLLER.CTL	
Z	Ζ	Χ	X		QUATERNION.CTL	
Z	Ζ	Χ	Χ		RAMSETE_EXE_TUNING.CTL	
Z	Ζ	Χ	Χ		RAMSETE.CTL	
Z	Ζ	Χ	Χ		ROTATION2D.CTL	
Z	Ζ	Χ	Χ		ROTATION3D.CTL	
Z	Ζ	Ζ	Χ	N/A	SIMPLE_MOTOR_FF_KA_TUNE_PARAMS.CTL	
Z	Ζ	Χ	Χ	N/A	SIMPLE_MOTOR_FF.CTL	
Z	Ζ	Χ	Χ	N/A	SINGLE_JOINT_ARM_SIM.CTL	
Z		Χ		N/A	SINGLE_JOINT_ARM_SIM_SIMULATION_PARAMS.CTL	
Z	Ζ	X	Х		SLEW RATE LIMITER.CTL	
Z	Ζ	X			SPLINE CTRL VECTOR.CTL	
Z	Z		X		SPLINE.CTL	
Z	Z		X		SWERVE DRIVE KINEMATICS.CTL	
Z	Z	$\overline{X}$			SWERVE DRIVE MODULE POSITION.CTL	
Z	Z	$\overline{X}$	X		SWERVE DRIVE MODULE STATE.CTL	
Z	Z		X		SWERVE DRIVE ODOMETRY.CTL	
Z	Z		X		SWERVE_DRIVE_ODOMETRY.CTL SWERVE_DRIVE_Pose_EST.CTL	
Z			X		SWERVE DRIVE POSE EST2.ctl	
Z			No		SWERVE DRIVE POSE EST2 INTERP RECORD.CTL	
		^	IVU	IV/H	OWLINE DINVE TOSE ESTA INTERPRECORD.CIL	

Page 39 / 40 FRC\_LabVIEW\_Trajectory\_Library\_Routines.xlsx

J.						
p <u>ace si</u>	m and	ctrl				
Z	Ζ	X	X	N/A	TIME_INTERPOLATABLE_BOOLEAN.CTL	
Z	Z	X	X	N/A	TIME_INTERPOLATABLE_DOUBLE.CTL	
Z	Z	X	X	N/A	TIME_INTERPOLATABLE_POSE2D.CTL	
Z	Z	X	X	N/A	TIME_INTERPOLATABLE_ROTATION2D.CTL	
Z	Ζ	Ζ	Χ	N/A	TIME_INTERPOLATABLE_VARIANT.CTL	
Z	Ζ	Χ	Χ	N/A	TIMER.CTL	
Z	Z	Χ	Χ	N/A	TRAJ_CONFIG.CTL	
Z	Ζ	Χ	Χ	N/A	TRAJ_CONSTRAINT_CENTRIPETAL_ACCEL.CTL	
Z	Ζ	Χ	Χ	N/A	TRAJ CONSTRAINT DIIF DRIVE KINEMATICS.CTL	
Z	Ζ	Χ	Χ	N/A	TRAJ_CONSTRAINT_DIIF_DRIVE_VOLTAGE.CTL	
Z	Ζ	Χ	Χ	N/A	TRAJ CONSTRAINT ELLIP REGION.CTL	
١		Χ		N/A	TRAJ CONSTRAINT JERK.CTL	Routine exists, it is just a shell
Z	Ζ	Χ	Χ	N/A	TRAJ_CONSTRAINT_MAX_VELOCITY.CTL	
Z	Ζ	Χ	Χ	N/A	TRAJ CONSTRAINT MECA DRIVE KINEMATICS.CTL	
Z	Ζ	Χ	Χ	N/A	TRAJ_CONSTRAINT_MINMAX.CTL	
Z	Ζ	Χ	Χ	N/A	TRAJ CONSTRAINT RECT REGION.CTL	
Z	Ζ	Χ	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	Χ	Χ	N/A	TRAJECTORY.CTL	
Z	Ζ	Χ	Χ	N/A	TRANSFORM2D.CTL	
Z	Ζ	Χ	Χ	N/A	TRANSFORM3D.CTL	
Z	Ζ	Χ	Χ	N/A	TRANSLATION2D.CTL	
Z	Ζ	Χ	Χ	N/A	TRANSLATION3D.CTL	
Z	Ζ	Χ	Χ	N/A	TRAPEZOID PROFILE CONSTRAINT.CTL	
Z	Ζ	Χ	Χ	N/A	TRAPEZOID PROFILE STATE.CTL	
Z	Ζ	Χ	Χ	N/A	TRAPEZOID PROFILE.CTL	
Z	Ζ	Χ	Χ	N/A	TWIST2D.CTL	
Z	Ζ	Χ	Χ	N/A	TWIST3D.CTL	
Z	Ζ	Χ	Χ	N/A	UNSCENTED KALMAN CORRECT FUNC GROUP.CTL	
Z	Ζ	Χ	Х	N/A	UNSCENTED KALMAN FILTER.ctl	
Z	Ζ	Χ	Х	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
Z	Ζ	Χ	Χ	NA	WEIGHTED WAYPOINT.CTL	New V1.5
N/A		N/A		N/A	X_Y_HEADINGS.CTL	Delete – obsolete
Ζ	Ζ	Χ	Χ	N/A	X_Y_PAIR.CTL	

Page 40 / 40 FRC\_LabVIEW\_Trajectory\_Library\_Routines.xlsx