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

> VI / CTL Totals 1037 1008 323 985 592 51 VI Total (X) 929 CTL Total (Z) 108
> VI Shell Total (/) 4 CTRL Shell Total (\)

Doc completed Pct 97.20% Optimization Pct 57.09%

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

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

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
FUNCTION GENERATOR	X	Χ		X	1			FunctionGenerator_Add_Value.vi		Similar to interpolated tree map			
	X	Χ		X	1			FunctionGenerator_Add_XY.vi		Similar to interpolated tree map			
	X	Χ		X	1			FunctionGenerator_Calculate.vi		Similar to interpolated tree map			
	X	Χ		X	SI			FunctionGenerator_Clear.vi					
	X	Χ	Χ	Χ	1			FunctionGenerator_Execute.vi		Similar to interpolated tree map			
	Y	Y		Y	C/			Function Congretor, New vi		Similar to interpolated tree man			

Implemented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
FUNCTION GENERATOR MATRIX $X \mid X$	X	Χ	1		FunctionGeneratoMatrixr_Add.vi		Similar to interpolated tree map			
XX	X	Χ	I		FunctionGenerator_Calculate.vi		Similar to interpolated tree map			
XX	X	X	SI		FunctionGenerator New vi		Similar to interpolated tree map			

FRC LabVIEW Trajectory Library – VI Implementat	tion List										
Revision 2.X 5/2/2022 – added implicit model follower and	l time inter שושפ שושפים שושם שושם שושפים שושים שושפים שושים שושים שושפים שושים	polatable Documented	PILIB	Menu Item	Test Routine	ample Program			Code Review	Test Program	Error Checking
LINEAR FIL	7	X			<del>\</del>	ຽ VI Name LinearFilter BackwardFiniteDifference.v	Function Prototype	Notes	<u>~~</u>	<del>y</del>	<u>Ü</u>
LINEAR FIL	X			X I X SI		LinearFilter Calculate.vi					
	X	X	X	X X		LinearFilter_CutoffFrequency.vi					
	X	X	Χ	ΧI		X LinearFilter_Execute.vi		Labview style helper			
	X	X	I	Vo I		LinearFilter_Factorial.vi		AN INTERNAL ROUTINE			
	X			XX		LinearFilter_HighPass.vi					
	X	X	X	X X X X		LinearFilter_HighPassBW1.vi				-	
	X		X	$\begin{array}{c c} X & X \\ X & X \end{array}$		LinearFilter_HighPassBW2.vi LinearFilter_LowPassBW1.vi					
	X		X	X X X		LinearFilter LowPassBW2.vi					
	X			X X		LinearFilter_MovingAverage.vi					
	X	X		X I		LinearFilter_New.vi					
	X			X SI		LinearFilter_Reset.vi					
	X	X		X SI		LinearFilter_ResetToValue.vi					
	X	X		XX		LinearFilter_SinglePoleIIR.vi					
	X	X	X	XX		LinearFilter_TimeConst.vi					
	mplemented	Documented	Not WPILIB	Menu Item Execution Optim	Test Routine	Sample Progran	Function Prototype	Notes	Code Review	Test Program	Error Checking
MEDIAN FIL	TFR X			X X		MedianFilter Calculate.vi	i unction Prototype	Notes	$\overline{}$		
	X		Χ	X I		X MedianFilter Execute.vi		Labview style helper			
	X	X		X SI		MedianFilter_New.vi		1			
	X			X SI		MedianFilter_Reset.vi					
	X	X	X	X SI		MedianFilter_ResetToValue.vi					
	Implemented	Documented	Not W	Menu Item Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
SLEW RATE FIL		X		X		SlewRateLimiter_Calculate.vi					
	X			X SI		SlewRateLimiter_Close.vi					
	X	X		X I X SI		X SlewRateLimiter_Execute.vi SlewRateLimiter GetRate.vi		Labview style helper			
	X			X = SI		SlewRateLimiter_GetRate.vi					
	X			X I		SlewRateLimiter NewInitialZero.vi					
	X			X 1		SlewRateLimiter Reset.vi					
	X	X		X SI		SlewRateLimiter_SetRate.vi					
	lemented	cumented	3	Menu Item Execution Optimized	t Routine	nple Program			de Review	t Program	or Checking
	dm	900	Not	iix Me	Test	S VI Name	Function Prototype	Notes	Ö	Tes	Ξπc
TIN	MER X	-	$\overline{X}$	X X		Timer_Close.vi	. Ended to total pe	releases semaphore		1-	4
	X	X		X		X Timer_Get.vi		·			
	X	X	X	X		Timer_GetAndReset.vi					
	L X	X	X I	VO O		Timer_GetInternal.vi		Internal (private) only	1		

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

| X | X | X | X | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X Χ X Timer HasPeriodPassed.vi XXXX X Timer HasPeriodPassedOnce.vi X XX X Timer New.vi Χ XX X Timer\_Reset.vi X X X X No Timer ResetInternal Internal (private) only X Timer\_Start.vi XX Χ XX Χ X Timer\_Stop.vi X X X No Timer\_StopInternal.vi Internal (private) only VI Name Function Prototype Notes TIME INTERPOLATABLE BOOLEAN X Χ TimeInterpBoolean\_AddSample.vi Update to use create matrix X Χ XX No TimeInterpBoolean\_CleanUp.vi Update to use create matrix X X X X SI TimeInterpBoolean Clear.vi XX Χ TimeInterpBoolean GetSample.vi X X X X SI X X X X SI TimeInterpBoolean New.vi TimeInterpBoolean SetMaxTime.vi nu Item VI Name Function Prototype Notes TIME INTERPOLATABLE DOUBLE X X TimeInterpDouble AddSample.vi X X Update to use create matrix TimeInterpDouble CleanUp.vi  $X \mid X \mid X \mid No \mid I$ Update to use create matrix X X X X SI TimeInterpDouble Clear.vi X X X X I TimeInterpDouble\_GetSample.vi X X X X SI TimeInterpDouble\_New.vi X X X X SI TimeInterpDouble\_SetMaxTime.vi Item Function Prototype Notes TIME INTERPOLATABLE POSE2D X Χ Χ TimeInterpPose2d AddSample.vi X Update to use create matrix X X X No I TimeInterpPose2d CleanUp.vi Update to use create matrix X X X X SI TimeInterpPose2d Clear.vi X X X X I TimeInterpPose2d GetSample.vi X X X X SI TimeInterpPose2d New.vi X X X X SI TimeInterpPose2d SetMaxTime.vi Item Function Prototype TIME INTERPOLATABLE ROTATION2D X X TimeInterpRotation2d AddSample.vi X X Update to use create matrix X X X No I TimeInterpRotation2d CleanUp.vi

X X X X SI

X X X X I

X X X X SI

X X X X SI

TimeInterpRotation2d Clear.vi

TimeInterpRotation2d New.vi

TimeInterpRotation2d\_GetSample.vi

TimeInterpRotation2d SetMaxTime.vi

Update to use create matrix

ided implicit model follower and time	ınterp	olatab	ole rou	lines.								
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine		Function Prototype	Notes	Code Review	Test Program	Error Checking
DIGITAL SEQUENTIAL LOGIC			X	Χ			DigSeqLogic_Delay.vi					
	Χ	Χ	X	Χ			DigSeqLogic_On_Delay.vi					
	Χ	Χ	X	Χ			DigSeqLogic_Off_Delay.vi					
	Χ	Χ	Χ	Χ			DigSeqLogic_One_Shot.vi					
	Χ	Χ	X	Χ			DigSeqLogic_SR_Flip_Flop.vi					
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine		Function Prototype	Notes	Code Review	Test Program	Error Checking
DEBOUNCER				Χ			Debouncer_New.vi					
	Χ	Χ		Χ			Debouncer_Calculate.vi					
	Χ	Χ	X	Χ			Debouncer_Execute.vi					
	Χ	Χ		No			Debouncer_Reset.vi					
	Χ	Χ		No			Debouncer_HasElapsed.vi					

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

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
BANG BANG	Χ	X		X	SI		BangBang_AtSetpoint.vi					
	Χ	X		X	SI		BangBang_Calculate_PV.vi					
	Χ	X		X	SI		BangBang_Calculate_SP_PV.vi					
	Χ	X	X	Χ	SI		BangBang_Execute.vi					
	Χ	X		Χ	SI		BangBang_GetAll.vi					
	X	X		X	SI		BangBang_GetError.vi					

y – VI Implementation Lis	st											
cit model follower and time in	terpola	table r					D D N					
)	Υ .	<u> </u>	+ ?	( 5	51		BangBang_New.vi					
/	Χ . Χ .	<b>Υ</b>	,	( 5	SI SI		BangBang_SetSetpoint.vi BangBang_SetTolerance.vi					
	^   .	\		(   3	)/		Bangbang_Set i olerance.vi					
CONTROLLER UTIL		Not WPILIB			ב ע		VI Name	Function Prototype	Notes This was short lived in WOULD, but	Code Review	Test Program	Error Checking
CONTROLLER UTIL	<b>X</b>   .	<	)	(   5	61		ControllerUtil_GetModulusError.vi		This was short lived in WPILIB, but still useful here.			
ELEV FF		Not WPILIB			Execution Optimized	Test Routine	VI Name  ElevFF Calculate.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
		<u>`</u>					ElevFF_CalculateVelocityOnly.vi					
		X					ElevFF_Execute.vi		LabVIEW style single call			
		X					ElevFF ExecuteVelocityOnly.vi		LabVIEW style single call			
		<b>(</b>		(			ElevFF_MaxAchieveAccel.vi					
		(	,				ElevFF_MaxAchieveVelocity.vi					
		<b>(</b>	,				ElevFF_MinAchieveAccel.vi					
		<b>Υ</b>	,				ElevFF_MinAchieveVelocity.vi					
		<b>Υ</b>	,	(			ElevFF_New_ZeroAccel.vi ElevFF_New.vi					
	nemented	Not WPILIB	77		Execution Opt	Test Routine	NI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
HOL_DRV_CTRL				<u>≥ u</u>	u		HolDrvCtrl AdvCalculate Trajectory.vi	Function Frototype	Added 1/24/2022	0	7	
1102_51(12_5	X	$\frac{1}{X}$	·   ')	<u>`</u>			HolDrvCtrl_AdvCalculate.vi		Added 1/24/2022			
	x .	<i>Κ Χ</i>	7	< s	S/		HolDrvCtrl_AtReference.vi		Added 1/26/21			
	X   .	<b>(</b>		(	l l		HolDrvCtrl_Calculate_Trajectory.vi		Added 1/26/21			
<b></b>		<b>(</b>		(	1		HolDrvCtrl_Calculate.vi		Added 1/26/21			
	X .	( X	,				HolDrvCtrl_Execute_Trajectory.vi		Added 1/24/2022			
		Υ X					HolDryCtrl_Execute.vi		Future Added 1/26/21			
<del></del>		(			SI SI		HolDrvCtrl_New.vi HolDrvCtrl_PackExecuteSP.vi		Added 1/20/21			
		$\begin{array}{c c} X & X \\ \hline X & X \end{array}$			-		HolDrvCtrl_PackPID.vi		Added 1/24/2022			
	X Z						HolDrvCtrl PackProfPID.vi		Added 1/24/2022			
	Υ .	<b>(</b>		(   5	31		HolDrvCtrl_SetEnabled.vi		Added 1/26/21			
	Υ .	<	7	( 5	8/		HolDrvCtrl_SetTolerance.vi		Added 1/26/21			
	X .	<b>Κ</b>	)	(   5	SI DAY							
		Documented Not WPILIB				Test Routine	NI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
PID CONTROLLER							PIDController_AdvCalculate_FF_Sp_Pv_Per.vi	<u>, , , , , , , , , , , , , , , , , , , </u>	Advanced PID			
1 12 0011111022211 /												
	Υ .	<i>( X</i>	· )	(			PIDController_AdvCalculate_FF_Sp_Pv.vi		Advanced PID			
	Υ .		· )	(			PIDController_AdvCalculate_FF_Sp_Pv.vi PIDController_AdvExecute.vi					

e interp	olatab	le rou	ıtines.			
X	X		Χ	SI	PIDController_AtSetpoint.vi	
X	X		Χ		PIDController_Calculate_PV.vi	
X	X		Χ		PIDController_Calculate_SP_PV.vi	
X	X		Χ	SI	PIDController_DisableContinousInput.vi	
X	X		Χ	SI	PIDController_EnableContinousInput.vi	
X	X	Χ	Χ		X PIDController_Execute.vi	Labview style helper
					PIDController_GetContinuousError.vi	OBSOLETE – Removed
X	X		Χ	SI	PIDController_GetPeriod.vi	
X	X		Χ	SI	PIDController_GetPID.vi	
X	X		Χ	SI	PIDController_GetPositionError.vi	
X	X		Χ	SI	PIDController_GetSetpoint.vi	
X	X		Χ	SI	PIDController_GetVelocityError.vi	
X	X		Χ	SI	PIDController_IsContinuousInputEnabled.vi	
X	X		Χ	1	PIDController_New.vi	
X	X		Χ	1	PIDController_NewPeriod.vi	
X	X	Χ	Χ	SI	PIDController Pack AdvLimits.vi	
X	X	Χ	Χ	SI	PIDController Pack AdvTuning.vi	
X	X	Χ	Χ	SI	PIDController Pack ErrorTolerance.vi	
X	X	Χ	Χ	SI	PIDController Pack InputLimits.vi	
X	X	Χ	Χ	SI	PIDController_Pack_Tuning.vi	
X	Χ		Χ	SI	PIDController_Reset.vi	
X	X		Χ	SI	PIDController SetD.vi	
X	Χ	Χ	Χ	SI	PIDController_SetDerivativeFilter.vi	Advanced PID
X	X	Χ	No		PIDController_SetFeedForward_OBSOLETE_DELETE.vi	Advanced PID, Obsolete –
						DELETE
X	X	X	No		PIDController_SetFFGain_OBSOLETE_DELETE.vi	Advanced PID, Obsolete –
. V	. V		V/	01	DIPO antarilar Catlari	DELETE
X	Χ		Χ	SI	PIDController_SetI.vi PIDController_SetInputRange.vi	OBSOLETE – Removed
V	Х		X	SI	PIDController_SetIntegratorRange.vi	OBSOLETE – Removed
X	X	X	X	SI	PIDController_SetUntegratorRange.vi	Advanced PID
					PIDController_SetOutputElmits.vi	Advanced PID
X	X	V	X	SI	PIDController_SetP.vi PIDController SetPeriod.vi	
X	X	Χ	X	SI SI	PIDController_SetPeriod.vi	
		V		SI		Advanced DID
X	X	Χ	X		PIDController_SetPIDF.vi	Advanced PID
X	X		X	SI	PIDController_SetSetpoint.vi	
X	X		X	SI	PIDController_SetTolerance.vi	
X	X		X	SI	PIDController_SetTolerancePandV.vi	

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
PROFILED PID CONTROLLER X	X		X	SI			ProfiledPIDController_AtGoal.vi					
X	X		X	SI			ProfiledPIDController_AtSetpoint.vi					
X	X		X				ProfiledPIDController_Calculate_Meas_Goal.vi					
X	X		X				ProfiledPIDController_Calculate_Meas_StateGoal_TrapCnsrt.vi					
X	X		Χ				ProfiledPIDController_Calculate_Meas_StateGoal.vi					
X	X		X				ProfiledPIDController_Calculate_Meas.vi					
X	X		X	SI			ProfiledPIDController_DisableContInput.vi					
X	X		X	SI			ProfiledPIDController_EnableContInput.vi					
X	X	X	X	I			ProfiledPIDController_Execute.vi		Single call LabVIEW style function.			
X	X		Χ	SI			ProfiledPIDController GetGoal.vi					
X	X		Χ	SI			ProfiledPIDController GetPeriod.vi					
X	X	X	Χ	SI			ProfiledPIDController GetPID.vi		WPILIB has separate getters.			
X	X		Χ	SI			ProfiledPIDController GetPositionError.vi		·			
X	X		Χ	SI			ProfiledPIDController GetSetpoint.vi					
X	X		Χ	SI			ProfiledPIDController_GetVelocityError.vi					
X	X		Χ	1			ProfiledPIDController New.vi					
X	X		X	1			ProfiledPIDController NewPeriod.vi					
X	X		Х	SI			ProfiledPIDController Reset PosOnly.vi					

EDC LabVIEW Traington/Library VI Implementation	Liet										
FRC LabVIEW Trajectory Library – VI Implementation Revision 2.X 5/2/2022 – added implicit model follower and tim		latahl	e routii	168			<u> </u>				
Revision 2.X 3/2/2022 – added implicit model follower and tim		X		X S	1	ProfiledPIDController Reset PosVel.vi					
		X		X		ProfiledPIDController Reset.vi					
	X	X		X		ProfiledPIDController SetConstraints.vi					
		X		X		ProfiledPIDController_SetGoal_PosOnly.vi					
		X		X S		ProfiledPIDController SetGoal.vi					
		X		X S		ProfiledPIDController_SetIntegratorRange.vi					
		X		X S	1	ProfiledPIDController_SetPID.vi					
	X			$X \mid S$		ProfiledPIDController_SetTolerance_PosOnly.vi					
	X	X		$X \mid S$	1	ProfiledPIDController_SetTolerance_PosVel.vi					
	Implemented	Documented	Not N	Menu Item			Function Prototype	Notes	Code Review	Test Program	Error Checking
RAMSETE				X S		Ramsete_AtReference.vi	AtReference				
		Χ		X		Ramsete_Calculate_Trajectory.vi	calculate_trajectory				
	X			X		Ramsete_Calculate.vi	calculate				
	X	X	X	X		Ramsete_Diff_DO_Eng.vi					
	X	X X	X X	X X		Ramsete Diff_DO_SI.vi Ramsete Execute ENG.vi	Use this one!!				
	X	X		X S		Ramsete_Execute_End.vi Ramsete_Execute_PackTuning_ENG.vi	Ose triis one!!				
				X S		Ramsete_Execute_PackTuning_ENG.vi					
	X	X	X	X		Ramsete Execute.vi					
	X	X		X		Ramsete New B Z.vi	new(b, zeta)				
		X		X		Ramsete New.vi	new				
	X	X		X S		Ramsete SetEnabled.vi	SetEnabled				
	X	Χ		X S	1	Ramsete_SetTolerance.vi	SetTolerance				
	X	Χ		X		Ramsete_SINC.vi	sinc	internal			
				7	3						
SIMPLE MOTOR FEEDFORWARD	$\begin{array}{c c} X \\ X \end{array}$	X	X	X S	Test Routil	SimpleMotorFF_Calculate_CalcAccel.vi   SimpleMotorFF_Calculate_NextV_Dt.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
SIMPLE MOTOR FEEDFORWARD	X X X	X X X	X	X X Menu Item		SimpleMotorFF_Calculate_CalcAccel.vi SimpleMotorFF_Calculate_NextV_Dt.vi SimpleMotorFF_Calculate.vi	public double calculate(double velocity, double acceleration)	Notes	Code Review	Test Program	Error Checking
SIMPLE MOTOR FEEDFORWARD	X X X	X	X	X X Menu Item		SimpleMotorFF_Calculate_CalcAccel.vi   SimpleMotorFF_Calculate_NextV_Dt.vi	public double calculate(double velocity, double acceleration) public double calculate(double velocity) public double maxAchievableAcceleration(double maxVoltage,	Notes	Code Review	Test Program	Error Checking
SIMPLE MOTOR FEEDFORWARD	X X X X	X X X	X	X Wenu Item X X X X X X X X X X X X X X X X X X X		SimpleMotorFF_Calculate_CalcAccel.vi SimpleMotorFF_Calculate_NextV_Dt.vi SimpleMotorFF_Calculate.vi SimpleMotorFF_CalculateVelocityOnly.vi SimpleMotorFF_MaxAchieveAccel.vi SimpleMotorFF_MaxAchieveVel.vi	public double calculate(double velocity, double acceleration) public double calculate(double velocity) public double maxAchievableAcceleration(double maxVoltage, double velocity) public double maxAchievableVelocity(double maxVoltage, double acceleration)		Code Review	Test Program	Error Checking
SIMPLE MOTOR FEEDFORWARD	X X X X X X X X X	X X X X X X	X	X X X X X X X X X X X X X X X X X X X		SimpleMotorFF_Calculate_CalcAccel.vi SimpleMotorFF_Calculate_NextV_Dt.vi SimpleMotorFF_Calculate.vi SimpleMotorFF_CalculateVelocityOnly.vi SimpleMotorFF_MaxAchieveAccel.vi SimpleMotorFF_MaxAchieveVel.vi SimpleMotorFF_MinAchieveAccel.vi	public double calculate(double velocity, double acceleration) public double calculate(double velocity) public double maxAchievableAcceleration(double maxVoltage, double velocity) public double maxAchievableVelocity(double maxVoltage, double acceleration) public double minAchievableAcceleration(double maxVoltage, double velocity)		Code Review	Test Program	Error Checking
SIMPLE MOTOR FEEDFORWARD	X X X X X X X X X X X X X X X X X X X	X X X X X X	X	X X X X X X X X X X X X X X X X X X X		SimpleMotorFF_Calculate_CalcAccel.vi SimpleMotorFF_Calculate_NextV_Dt.vi SimpleMotorFF_Calculate.vi SimpleMotorFF_CalculateVelocityOnly.vi SimpleMotorFF_MaxAchieveAccel.vi SimpleMotorFF_MaxAchieveVel.vi SimpleMotorFF_MinAchieveAccel.vi	public double calculate(double velocity, double acceleration) public double calculate(double velocity) public double maxAchievableAcceleration(double maxVoltage, double velocity) public double maxAchievableVelocity(double maxVoltage, double acceleration) public double minAchievableAcceleration(double maxVoltage, double velocity) public double minAchievableVelocity(double maxVoltage, double acceleration)		Code Review	Test Program	Error Checking
SIMPLE MOTOR FEEDFORWARD	X X X X X X X X X	X X X X X X	X	X X X X X X X X X X X X X X X X X X X		SimpleMotorFF_Calculate_CalcAccel.vi SimpleMotorFF_Calculate_NextV_Dt.vi SimpleMotorFF_Calculate.vi SimpleMotorFF_CalculateVelocityOnly.vi SimpleMotorFF_MaxAchieveAccel.vi SimpleMotorFF_MaxAchieveVel.vi SimpleMotorFF_MinAchieveAccel.vi	public double calculate(double velocity, double acceleration) public double calculate(double velocity) public double maxAchievableAcceleration(double maxVoltage, double velocity) public double maxAchievableVelocity(double maxVoltage, double acceleration) public double minAchievableAcceleration(double maxVoltage, double velocity) public double minAchievableVelocity(double maxVoltage, double acceleration) public SimpleMotorFeedforward(double ks, double kv, double ka)		Code Review	Test Program	Error Checking
SIMPLE MOTOR FEEDFORWARD	X X X X X X X X X X X X X X X X X X X	X X X X X X	X	X X X X X X X X X X X X X X X X X X X		SimpleMotorFF_Calculate_CalcAccel.vi SimpleMotorFF_Calculate_NextV_Dt.vi SimpleMotorFF_Calculate.vi SimpleMotorFF_CalculateVelocityOnly.vi SimpleMotorFF_MaxAchieveAccel.vi SimpleMotorFF_MaxAchieveVel.vi SimpleMotorFF_MinAchieveAccel.vi	public double calculate(double velocity, double acceleration) public double calculate(double velocity) public double maxAchievableAcceleration(double maxVoltage, double velocity) public double maxAchievableVelocity(double maxVoltage, double acceleration) public double minAchievableAcceleration(double maxVoltage, double velocity) public double minAchievableVelocity(double maxVoltage, double acceleration)		Code Review	Test Program	Error Checking
SIMPLE MOTOR FEEDFORWARD  '===================================	X X X X X X X X X X X X X X X X X X X	X X X X X X X X	X	X X X X X X X X X X X X X X X X X X X		SimpleMotorFF_Calculate_CalcAccel.vi SimpleMotorFF_Calculate_NextV_Dt.vi SimpleMotorFF_Calculate.vi SimpleMotorFF_CalculateVelocityOnly.vi SimpleMotorFF_MaxAchieveAccel.vi SimpleMotorFF_MaxAchieveVel.vi SimpleMotorFF_MinAchieveAccel.vi SimpleMotorFF_MinAchieveVel.vi SimpleMotorFF_MinAchieveVel.vi	public double calculate(double velocity, double acceleration) public double calculate(double velocity) public double maxAchievableAcceleration(double maxVoltage, double velocity) public double maxAchievableVelocity(double maxVoltage, double acceleration) public double minAchievableAcceleration(double maxVoltage, double velocity) public double minAchievableVelocity(double maxVoltage, double acceleration) public SimpleMotorFeedforward(double ks, double kv, double ka)		Code Review	Test Program	Error Checking

implicit model follower and ti		polatal	ole rout	ines.					-				
COORDINATE AX				Χ	SI			CoordAxis_D.vi					
	X			Χ	SI SI			CoordAxis_E.vi					
	X	X		Χ	SI			CoordAxis_N.vi					
	X	X		Χ				CoordAxis New.vi					
	X	X		Χ	SI			CoordAxis_S.vi					
	X	X		Χ	SI			CoordAxis_U.vi					
	X	X		Χ	SI			CoordAxis_W.vi					
												<u> </u>	
COORDINATE SYSTEM	X	X	Not WPILIB	X X Menu Item	ଓ ଓ ଓ Execution Optimized	X Test Routine		VI Name  CoordSystem_Convert_Pose3d.vi  CoordSystem_Convert_Rotation3d.vi  CoordSystem_Convert_Translation3d.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	X	X		Χ	SI	X		CoordSystem_EDN.vi					
	X	X		Χ	SI	X		CoordSystem_NED.vi					
	X	Χ		Χ	SI	X		CoordSystem_New.vi					
	X	X		Χ	SI	Χ		CoordSystem_NWU.vi					
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program				Code Review	st Program	or Checking
	m	ŏ	Ş	Me	Ϋ́	ĕ	Sai	VI Name	Function Prototype	Notes	Š	Test	Error
POSE2I		X		$\overline{X}$	SI		٠,	Pose2d_Equals.VI	boolean equals( other obj )				7
	X	X		X	X			Pose2d_Exp.vi	pose2d exp( twist2d twist )				
	X	X		X	SI			Pose2d_getRotation.vi	rotation2d getRotation()	can also use cluster unpack			
	X	X		X	SI			Pose2d_getTranslation.vi	translation2d getTranslation()	can also use cluster unpack			
	X	X	X	X	SI			Pose2d_getXY.vi	a anotation 2 a governanciation ()	san also uso claste, ampaex			
	X	X	X	X	SI			Pose2d_getXYAngle.vi					
	X	X	7.	X	1			Pose2d Interpolate.vi					
	X	X		X	Χ			Pose2d_Log.vi	twist2d log( pose2d end )				
	X	X		X	SI			Pose2d Minus.vi	transform2d minus( pose2d other )				
	X	X		X	SI			Pose2d New TRRO.vi	pose2d new( translation2d, rotation2d )				
	X	X		X	SI			Pose2d New.vi	pose2d new( double x, double y, rotation2d )				
	X	X		X				Pose2d_Plus.vi	pose2d plus( transform2d other )				
	X	X		Χ	SI SI			Pose2d RelativeTo.vi	pose2d relativeto( pose2d other )				
	X	X		Χ	SI			Pose2d_TransformBy.vi	pose2d transformby( transform2d other )				
									pose2d new()	can use cluster constant			
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program				Code Review	st Program	Error Checking
			≥				S	VI Name	Function Prototype	Notes			Er
POSE3I				Χ	SI			Pose3d_Equals.VI					
	X	X		Χ	X SI			Pose3d_Exp.vi					
	X	X		Χ	SI			Pose3d_getRotation.vi					
	X	X		Χ	SI			Pose3d_getTranslation.vi					
	X	X	X	Χ	SI			Pose3d_getXYZ.vi					
	X	X		Χ	1			Pose3d_Interpolate.vi					
	X	X		Χ	Χ			Pose3d_Log.vi					
	X	X		Χ	SI			Pose3d_Minus.vi					
	X	X		Χ	SI			Pose3d_New.vi					
	X	X		X	SI			Pose3d_New_Default.vi					
	X	X		Χ	SI			Pose3d_New_Trans3dRot3d.vi					

	X			X	SI		Pose3d_Plus.vi					
		X X		X No	SI SI		Pose3d_RelativeTo.vi Pose3d_RotationVectorToMatrix.vi					
	1 X 1	$\frac{\lambda}{X}$		X	SI		Pose3d ToPose2d.vi					
		$\hat{X}$		$\hat{X}$	SI		Pose3d_TransformBy.vi					
		^		^	- 0,		1 03C0d_Transionniby.vi					
		Doc	Not WPILIB	Menu Item	Execution Optimized	Test Routine	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
QUATERNION		X		X	SI		Quaternion_Equals.vi					
		X		X	SI		Quaternion_Get_All.vi					
		X		X	SI		Quaternion_Get_LVQuat.vi					
		X X		X	SI SI		Quaternion_Get_Vect.vi Quaternion_Get_W.vi					
		$\hat{X}$		$\hat{x}$	SI		Quaternion Inverse.vi					
		$\hat{X}$		$\hat{X}$	SI		Quaternion New.vi					
		$\frac{\lambda}{X}$		$\hat{X}$	SI		Quaternion New Default.vi					
		X		X	SI		Quaternion New LVQuat.vi					
		X		X	SI		Quaternion Normalize.vi					
		X		X	SI		Quaternion Plus.vi					
		Χ		Χ	SI		Quaternion_Times.vi					
	X	X		X	SI		Quaternion_ToRotationVector.vi					
			Not WPILIB	Menu Item	Execution	Test Routine	VI Name	Function Prototype	Notes	Code Review	Test Pro	Error Checking
ROTATION2D		X		Χ	SI		Rotation2d_CreateAngle.vi	rotation2d new( double value )				
		X		X	SI		Rotation2d_CreateAngleDegrees.vi	rotation2d fromDegrees( double degrees )	convert to radians then create			
		X X		X	SI SI		Rotation2d_CreateAngleRotations.vi Rotation2d_CreateXY.vi	rotation2d new( double x, double y )				
		$\hat{X}$		$\hat{x}$	SI		Rotation2d_CreateX1.vi	boolean equals( rotation2d other )				
			X	$\hat{X}$	SI		Rotation2d_Equals.vi	boolean equals (rotation 2 d other )	New 1/26/21			
	X	X		X	SI		Rotation2d_GetCos.VI	double getCos()	use cluster unpack			
	X	X		X	SI		Rotation2d_GetDegrees.VI	double getDegrees()	use cluster unpack, then convert to			
	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \				-01		D ( ) 0   0   D     1   1   1	1.11.15.15.0	degree			
	X			X	SI		Rotation2d_GetRadians.VI Rotation2d_GetRotations.vi	double getRadians()	use cluster unpack			
		X X	+	X	SI SI		Rotation2d_GetRotations.vi	double getSin()	use cluster unpack			
		$\hat{x}$	$\rightarrow$	$\hat{x}$	SI		Rotation2d GetTan.VI	double getTan()	can calculate			
		$\frac{\lambda}{X}$		$\hat{X}$	SI		Rotation2d_Interpolate.vi					
		X		Χ	SI		Rotation2d_Minus.vi	rotation2d minus( rotation2d other )				
	X	Χ		Χ	SI		Rotation2d_Plus.vi	rotation2d plus( rotation2d other )				
		Χ		Χ	SI		Rotation2d_RotateBy.vi	rotation2d rotateby( rotation2d other )				
	X	X		Χ	SI		Rotation2d_Times.vi	rotation2d times( double scalar )				
	X	Χ		Χ	SI		Rotation2d_UnaryMinus.vi	rotation2d unaryminus( )				
								rotation'/d now//			1	
								rotation2d new()	can use cluster constant			

FRC LabVIEW Trajectory Library – VI Implement Revision 2.X 5/2/2022 – added implicit model follower a ROTATIO

wer and time			e rout		01	I	I	D. ( 0.1 0 ( 4					
TATION3D		X X		X	SI SI			Rotation3d_Create_AxisAngle.vi Rotation3d_Create_Default.vi					
ŀ		X   X		X	SI			Rotation3d_Create_Default.vi					
		$\hat{x}$		X	SI			Rotation3d_Create_Quaternion.vi					
-		$\hat{x}$		X	SI			Rotation3d_Equals.vi					
-			Χ	X	SI			Rotation3d_Equals.vi					
-		$\hat{x}$	^	X	SI			Rotation3d GetQuaternion.vi					
F		<u>^</u>		X	SI			Rotation3d_GetXYZ.vi					
-		$\hat{x}$		X	SI			Rotation3d_Interpolate.vi					
-				X				Rotation3d Minus.vi					
-		X		X	SI SI			Rotation3d_Minus.vi					
-		X											
-		X		X	SI			Rotation3d_RotateBy.vi					
-		X		X	SI			Rotation3d_Times.vi					
-		X		X				Rotation3d_ToRotation2d.vi					
	X	X		Χ	SI			Rotation3d_UnaryMinus.vi					
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimizea	Test Routine	ile Program	VI Name			Review	Program	
	o)e	วั	τ Z	חמ	S	st I	ш				de	st I	
	<u>ti</u>	۵	Š	Ø	Ě	Ţe;	Sa	VI Name	Function Prototype	Notes	Code	Test	
SFORM2D		$\overline{x}$		$\overline{X}$	SI			Transform2d Create PosePose.vi	transform2d new( pose2d, pose2d )				
		X		Χ	SI			Transform2d_Create_TransRot.vi	transform2d new( translation2d, rotation2d )				
		X		X	SI			Transform2d_Equals.VI	boolean equals( other transform2d )				
		X		X	SI			Transform2d GetRotation.VI	rotation2d getRotation()	use cluster unpack			
		$\hat{x}$		X	SI			Transform2d GetTranslation.VI	translation2d getTranslation()	use cluster unpack			
-			Χ	X	SI			Transform2d GetXY.vi	translation2d getTranslation()	use cluster unpack			
-			X	X	SI			Transform2d_GetXYAngle.vi					
-		$\hat{x}$	^	$\hat{x}$	SI			Transform2d Inverse.vi	transform inverse()	new			
-		$\hat{x}$		$\hat{x}$	Si			Transform2d_Plus.vi	uansioni inverse()	TIEW			
-		$\hat{x}$		X	SI			Transform2d Times.vi	transform2d times( double scalar )				
	^	^		^	JI			Transionizu_rimes.vi	transform2d new( )	can use cluster constant			
					_				transioniza new( )	can use cluster constant			
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	ample Program	VI Name			ode Review	Test Program	
NEODUS - 1	<u> </u>		>_		<u> </u>	<del> </del> _	Ŋ	VI Name	Function Prototype	Notes	Š	<u> </u>	
FORM3D		X	-	X	SI			Transform3d_Create_Default.vi					
		X		X	SI			Transform3d_Create_Pose3dPose.3dvi					
-		X		X	SI			Transform3d_Create_Trans3dRot3d.vi					
		X		X	SI			Transform3d_Equals.VI					
		X		X	SI			Transform3d_GetRotation3d.VI					
		X		X	SI			Transform3d_GetTranslation3d.VI					
			Χ	X	SI			Transform3d_GetXYZ.vi					
		X		Χ	SI			Transform3d_Inverse.vi					
		X		Χ	Si			Transform3d_Plus.vi					
-	X	X		Χ	SI			Transform3d_Times.vi					
L					ā	1	1	1	I .	I	I		l
	nented	nented	PILIB	ltem	tion Optimize	Routine	Program				Review	am	

Function Prototype

translation2d new( double x, double y )

Translation2d\_Create\_DistAng.vi
Translation2d\_Create.vi

Notes

TRANSLATION2D  $X \mid X \mid X \mid X \mid X \mid X$ 

X SI X SI

X SI X SI

	VV	\ \frac{\lambda}{\times}			Translation2d CatDistance vi	devible autDistance/translationOd athem)				
-	X X	X	SI		Translation2d_GetDistance.vi	double getDistance( translation2d other )				
-	XX	X	SI		Translation2d_GetNorm.VI	double getNorm()	can use cluster unpack			
_	XX	X	SI		Translation2d_GetX.VI	double getX()	can use cluster unpack			
	X X		SI		Translation2d_GetXY.VI					
	$X \mid X$	X	SI		Translation2d_GetY.VI	double getY()	can use cluster unpack			
L	X X	X	SI		Translation2d_Interpolate.vi					
	XX	X	SI		Translation2d_Minus.vi	translation2d minus( translation2d other )				
	XX	X	SI		Translation2d Plus.vi	translation2d plus( translation2d other )				
	XX	X	SI		Translation2d_RotateBy.vi	translation2d rotateBy( rotation2d other )				
	XX	X	SI		Translation2d_Times.vi	translation2d times( double scalar )				
	XX	X	SI		Translation2d_UnaryMinus.vi	translation2d unaryminus( )				
						translation2d new()	can use cluster constant			
						translation2d div( double scalar )	can multiply by 1/scalar			
TRANSLATION3D	Documented   N   N   N   N   N   N   N   N   N	X X X X	S   S   S   S   S   S   S   S   S   S	Sample Program		Function Prototype	Notes	Code Review	Test Program	Error Checking
<b>⊢</b>					Translation3d ToTranslation2d vi					
_	XX	X	SI							
-		X			Translation3d_UnaryMinus.vi					
TWIST2D	X X X X X Documented	Not WPILIB  X Menu Item	© Execution Optimized © Test Routine	Sample Program	Translation3d_UnaryMinus.vi  VI Name Twist2d_Create.vi	Function Prototype twist new( x, y, theta )	Notes	Code Review	Test Program	Error Checking
	X X X X X X Documented	Not WPILIB  X  Menu Item	© © Execution Optimized © Test Routine	Sample Program	Translation3d_UnaryMinus.vi  VI Name  Twist2d_Create.vi Twist2d_Equals.VI		Notes		Test Program	
	X X X X X Documented	Not WPILIB  X  Menu Item	© © Execution Optimized © Test Routine	Sample Program	Translation3d_UnaryMinus.vi  VI Name Twist2d_Create.vi	twist new(x, y, theta)	Notes		Test Program	
	X X X X X X X X X X X X X X X X X X X	Not WPILIB X X Menu Item	otimized ত্ৰ ত্ৰ Execution Optimized ত্ৰ Test Routine	Program Sam	Translation3d_UnaryMinus.vi  VI Name Twist2d_Create.vi Twist2d_Equals.VI Twist2d_GetAll.VI	twist new( x, y, theta ) boolean equals( obj other )		Code	est Program	Checking
	Implemented X X Implemented X X X Documented X X X Documented X X X Documented X X X X Documented X X X X X X X X X X X X X X X X X X X	Not WPILIB    Not WPILIB   Not WPILIB	Execution Optimized © © © Execution Optimized © Test Routine	Sample Program Sam	Translation3d_UnaryMinus.vi  VI Name Twist2d_Create.vi Twist2d_Equals.VI Twist2d_GetAll.VI  VI Name	twist new(x, y, theta)	Notes		Test Program	Error
TWIST3D	X   X   X   X   X   X   X   X   X   X	Not WPILIB  X   Menu Item   X   X   Menu Item   X   X   X   X   X   X   X   X   X	© Execution Optimized © © © © Execution Optimized © X Test Routine	Sample Program Sam	Translation3d_UnaryMinus.vi  VI Name Twist2d_Create.vi Twist2d_Equals.VI Twist2d_GetAll.VI  VI Name Twist3d_Create.vi	twist new( x, y, theta ) boolean equals( obj other )		Code	Test Program	Checking
TWIST3D	Implemented X X Implemented X X X Documented X X X Documented X X X Documented X X 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 Menu Item  X  X	Execution Optimized © © © Execution Optimized © Test Routine	Sample Program Sam	Translation3d_UnaryMinus.vi  VI Name Twist2d_Create.vi Twist2d_Equals.VI Twist2d_GetAll.VI  VI Name	twist new( x, y, theta ) boolean equals( obj other )		Code	Test Program	Checking

boolean equals( translation other )

'========= KINEMATICS '======== Translation2d\_Equals.vi
Translation2d\_GetAngle.vi

022 – added implicit model follower and time	interpo	olatab	le rou	tines					-				
ozz addod impiloti modor followor dna timo	, into p	olutub	10 100		þ								
CHASSIS SPEEDS		X X Documented	X Not WPILIB	X Menu Item	ର ଓ Execution Optimize	Test Routine		VI Name ChassisSpeeds_FromFieldRelativeSpeeds.VI ChassisSPeeds_GetXYOmega.vi ChassisSpeeds_New.vi	chassisspeeds fromFieldRelativeSpeeds( double x, double y, double angvel, rotation2d robotangle ) chassisspeeds new ( double xvel, double yvel, double angvel )	Notes  can use cluster constant	Code Review	Test Program	Error Checking
									·	-			
DIFFERENTIAL DRIVE KINEMATICS		X Documented	Not WPILIB	X Menu Item	- Execution Optimized	X Test Routine		VI Name DiffKinematics_New.vi	diffDriveKine new( double trackWidth )	Notes	Code Review	Test Program	Error Checking
	X	Χ		Χ	Χ	Χ		DiffKinematics_toChassisSpeed.vi	chassisSpeeds toChassisSpeeds( diffDrWheelSpeeds )				
	X	X		Χ	SI	X		DiffKinematics_toWheelSpeed.vi	diffDriveWheelSpeed toWheelSpeeds( chassisSpeeds )				
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine		VI Name		Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE ODOMETRY			Χ					DiffOdometry_Execute.vi		DONT NEED			
	X	X		X	X			DiffOdometry_Update.vi	pose2d update( rotation2d gyro, double leftdist, double right dist )  diffDrOdom new( rotation gyro, pose initial )  diffDrOdom new( rotation gyro )  void resetPosition( pose2d, rotation2d )  pose2d getPoseMeters()	Incorporates enhanced reset incorporated into "update"			
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name		Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE WHEEL SPEEDS									diffDrWheelSpeeds new()				
	V	V .		V	V			DiffM/bool Normaliza vi	diffDrWheelSpeeds new( double leftVel, double rightVel )				
l	Χ	X		Χ	X			DiffWheel_Normalize.vi	void normalize( double maxVel )				
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program				Code Review	sst Program	Error Checking
_			≥		Щ				Function Prototype	Notes	გ	7e	Щ
MECANUM DRIVE KINEMATICS		Χ		Χ	I			MecaKinematics_New.vi					
	Χ	Χ		Χ	Χ			MecaKinematics_SetInverseKinematics.vi					
	Χ	Χ		Χ	Χ			MecaKinematics_ToChassisSpeeds.vi					
	Χ	Χ		Χ	Χ			MecaKinematics_ToWheelSpeeds.vi					
l	X	Χ		Χ	Χ			MecaKinematics_ToWheelSpeedsZeroCenter.vi					

array and "4" calls)

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	ଞ୍ଚ VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
SWERVE DRIVE ODOMETRY							SwerveOdometry_Execute4.vi					
							SwerveOdometry_ExecuteX.vi					
	Χ			X			SwerveOdometry_GetPosition.VI	public Pose2d getPoseMeters()				
	X	X		X			SwerveOdometry_New.VI	public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose)				<u> </u>
	X	X		X			SwerveOdometry_NewZeroCenter.VI	public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle)				
	X			X			SwerveOdometry_ResetPosition.VI	public void resetPosition(Pose2d pose, Rotation2d gyroAngle)				
	Χ	X	X	X			SwerveOdometry_Update4.VI		For 4 module drives			
	X	X	X	X			SwerveOdometry_UpdateWithTime4.VI		For 4 module drives			
	Χ		X	X			SwerveOdometry_UpdateWithTimeX.VI		uses array as input			
	X	X	X	X			SwerveOdometry UpdateX.VI		uses array as input			
								public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates)	variable parameters (replace with array and "4" calls)			
								public Pose2d update(Rotation2d gyroAngle, SwerveModuleState moduleStates)	variable parameters (replace with array and "4" calls)			
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine		Function Prototype	Notes	Code Review	Test Program	Error Checking
SWERVE DRIVE MODULE STATE	X	X		X	SI		SwerveModuleState_CompareTo.vi	public int compareTo(SwerveModuleState o)				
				X	SI		SwerveModuleState_Get.vi					
	Χ	X		X	SI		SwerveModuleState_New.vi	public SwerveModuleState(double speedMetersPerSecond, Rotation2d angle)				
	X	X		X	SI		SwerveModuleState_Optimize.vi	public SwerveModuleState optimize( SwerveModuleState desired, Rotation2d angle )	,			<u> </u>

'====== SPLINE '========														
		Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
	CUBIC HERMITE SPLINE								`	protected SimpleMatrix getCoefficients()	not needed, use cluster unpack			
		X	X		X				CubicHermiteSpline_getControlVectorFromArrays.vi	private SimpleMatrix getControlVectorFromArrays( double[] initialVector, double[] finalVector)				
		X	Χ		Χ				CubicHermiteSpline_makeHermiteBasis.vi	private SimpleMatrix makeHermiteBasis()				
		X	X		X				CubicHermiteSpline_New.vi	public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector)				

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program ≤	Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
POSE WITH CURVATURE	X	X		Χ	SI		Po	oseWithCurve_New.vi	public PoseWithCurvature(Pose2d poseMeters, double				
									curvatureRadPerMeter)				
									public PoseWithCurvature()	can use cluster constant			

ed implicit model follower and time		oolatal	ble roi	utines									
I I I I I I I I I I I I I I I I I I I		2.3(4)							public Pose2d poseMeters	not needed, use cluster unpack			
									public double curvatureRadPerMeter	not needed, use cluster unpack			
					75								
QUINTIC HERMITE SPLINE	X   X   X   X   X   X   X   X   X   X	X Documented	Not WPILIB	X X Menu Item	Execution Optimized	Test Routine		VI Name QuinticHermiteSpline_getControlVectorFromArrays.vi QuinticHermiteSpline_makeHermiteBasis.vi QuinticHermiteSpline_New.vi	Function Prototype  private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector)  private SimpleMatrix makeHermiteBasis()  public QuinticHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector,	Notes	Code Review	Test Program	Error Checking
									double[] vFinalControlVector)				
									protected SimpleMatrix getCoefficients()	not needed, use cluster unpack			
	(Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine		VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
SPLINE (Abstract class)	Χ	Χ		X				Spline_getPoint.vi	public PoseWithCurvature getPoint(double t)				
									Spline(int degree)				
									public static class ControlVector public ControlVector(double[] x, double[] y)	implemented as data structure			
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optim	Test Routine	Sample Program		5. (° B.)		Code Review	est Program	Error Checking
SPLINE HELPER			_ <					VI Name	Function Prototype private static Spline.ControlVector getCubicControlVector(double	Notes	O	, i	Щ
SPLINE HELPER	X	X		X	SI			SplineHelp_GetCubicCtrlVector.vi	scalar, Pose2d point)				
	X	X		X		X		SplineHelp_GetCubicCtrlVectorsFromWayPts.vi	public static Spline.ControlVector[] getCubicControlVectorsFromWaypoints( Pose2d start, Translation2d[] interiorWaypoints, Pose2d end )				
	Χ	Χ	X	X				SplineHelp_GetCubicCtrlVectorsFromWeightedWayPts.vi			_		
	X	X		No				SplineHelp_GetCubicSpline_Calc1.vi		internal			
	X	X		No				SplineHelp_GetCubicSpline_Calc2.vi		internal			
	X	X	X	No				SplineHelp_GetCubicSpline_Calc3.vi	nublic static CubicHormitoSpling	internal			
	X	X		X		X		SplineHelp_getCubicSplinesFromControlVectors.vi	public static CubicHermiteSpline[] getCubicSplinesFromControlVectors( Spline.ControlVector start, Translation2d[] waypoints, Spline.ControlVector end)				
	X	X		X	SI			SplineHelp_GetQuinticCtrlVector.vi	private static Spline.ControlVector getQuinticControlVector(double				
								SplineHelp_GetQuinticCtrlVectorsFromWayPts.vi	scalar, Pose2d point) public static List <spline.controlvector> getQuinticControlVectorsFromWaypoints( List<pose2d> waypoints )</pose2d></spline.controlvector>	REMOVED 2762			
								SplineHelp_GetQuinticCtrlVectorsFromWeightedWayPts.vi		REMOVED 2762			
	X	X		X				SplineHelp_getQuinticSplinesFromControlVectors.vi	public static QuinticHermiteSpline[] getQuinticSplinesFromControlVectors( Spline.ControlVector[] controlVectors)				
	Χ	Χ	X	X				SplineHelp_GetQuinticSplinesFromWeightedWayPts.vi		New 2762			
	Χ	Χ		X				SplineHelp_GetQuinticSplinesFromWayPts.vi		New 2762			
	X	X		No				SplineHelp_ThomasAlgorithm.vi	private static void thomasAlgorithm(double[] a, double[] b, double[ c, double[] d, double[] solutionVector)	internal			

Revision 2.X 5/2/2022 – added implicit model follower and time	interp	oolata	able ro	outine	s.				_				
	þ	þ	<b>m</b>		Optimized	90	ogram				Me	m.	king
	Implemente	Documente	Not WPILIB	Meni Item	Execution		Sample Pro				ode Revie	Test Progrä	rror Checi
SPLINE PARAMETERIZER	<u>2</u> X	X	_ <	X		i <u>F</u>		VI Name SplineParam_Spline_T0_T1.vi	Function Prototype public static List <posewithcurvature> parameterize(Spline spline</posewithcurvature>	Notes		<u> </u>	Щ
-									double t0. double t1)				
		X		X		X		SplineParam_Spline.vi	public static List <posewithcurvature> parameterize(Spline spline)</posewithcurvature>				
	X	X	X	N	0			SplineParam_StackGet.vi		internal			
_	X	X	X	N	0			SplineParam_StackPop.vi SplineParam StackPush.vi		internal			
L	^	_ ^		/ / /	0			opilileralalii_otackrusii.vi		internal			
'======= TRAJECTORY '========													
					mized		E						
	þ	þ	m		Onti	e e	ogra				8	ш	ecking
	Implemente	Documente	Vot WPILIB	3			Sample Prog				evie	ogra	Chec
	lem	m	Ŋ	Menu Item	Execution	t RC	nple				ř R	# P	
	lmp	ООС	Not	Me	X X	Tes	San	VI Name	Function Prototype	Notes	S	Test	Error
TRAJECTORY		X		λ				Trajectory_Concatenate.vi					
	X	X		λ		,		Trajectory_equals.vi	boolean equals( other obj )	FUTURE			
	X	X			( S			Trajectory_GetStates.vi Trajectory_GetTotalTime.vi	public List <state> getStates() public double getTotalTimeSeconds()</state>	not needed, use unpack not needed, use unpack			
-	X	X		N				Trajectory_lerp_double.vi	private static double lerp(double startValue, double endValue,	internal			
									double t)				
	X	X		N	o   S	/		Trajectory_lerp_Pose.vi	private static Pose2d lerp(Pose2d startValue, Pose2d endValue, double t)	internal			
	Χ				S	ı		Trajectory_New_Empty.vi					
	Χ	X		λ	S	1		Trajectory_New.vi	public Trajectory(final List <state> states)</state>				
	Χ	X		λ				Trajectory_RelativeTo.vi	public Trajectory relativeTo(Pose2d pose)				
	X	X		λ				Trajectory_Sample.vi	public State sample(double timeSeconds)				
	X	X	X	λ				Trajectory_SampleReverse.vi		Sample in reverse order. Negate sample.			
	Χ	X		λ	(			Trajectory_TransformBy.vi	public Trajectory transformBy(Transform2d transform)				
									public Pose2d getInitialPose()	can use cluster unpack, array index			
	Implemented	Documented	t WPILIB		Execution Optimized	ue Je	Sample Program				de Review	st Program	or Checking
_			Not				Sai	VI Name	Function Prototype	Notes	Š	7 68	Err
TRAJECTORY_STATE		X			( S	1		TrajectoryState_Equals.vi	boolean equals( other obj )				
		X			S			TrajectoryState_GetAll.vi					
	X	X			S	1		TrajectoryState_GetPose.vi	Chata intermediate/Chata and Value of subjects				
-	X	X			( S	1		TrajectoryState_Interpolate.vi TrajectoryState_New.vi	State interpolate(State endValue, double i) public State(double timeSeconds, double				
	^	^		^	`   ``	'		TrajectoryState_ivew.vi	velocityMetersPerSecond, double				
									accelerationMetersPerSecondSq, Pose2d poseMeters, double				
									curvatureRadPerMeter)				
									public State()				

RC LabVIEW Trajectory Library – VI Implementation												
Revision 2.X 5/2/2022 – added implicit model follower and time	interp	oolatal	ole rout	ines.	75							
	plemented	Documented	t WPILIB	Menu Item	ecution Optimizec	Test Routine Sample Program				de Review	st Program	or Checking
	<u>६</u>		Not		Ě	7e		Function Prototype	Notes	ိ	7e	En
TRAJECTORY CONFIG	X	X	~	X	SI SI		TrajectoryConfig_Create.vi  TrajectoryConfig_setCentripetalAccel.vi	public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq)				
	X	X	X	X	SI		TrajectoryConfig_setCentripetalAccel.vi  TrajectoryConfig_setKinematicsDiffDrive.vi	public TrajectoryConfig setKinematics(DifferentialDriveKinematics				
				^				kinematics)				
	X			X	SI		TrajectoryConfig_setKinematicsMecanumfDrive.vi	public TrajectoryConfig setKinematics(MecanumDriveKinematics kinematics)				
	X	X		X	SI		TrajectoryConfig_setKinematicsSwerveDrive.vi	public TrajectoryConfig setKinematics(SwerveDriveKinematics kinematics)				
	Χ	X		Χ	SI		TrajectoryConfig_setReversed.vi	public TrajectoryConfig setReversed(boolean reversed)				
	Χ	Χ	Χ	Χ	SI		TrajectoryConfig_setVoltageDiffDrive.vi	, , , , , , , , , , , , , , , , , , , ,				
								public TrajectoryConfig addConstraint(TrajectoryConstraint constraint)	Implemented differently, can't duplicate.			
								public TrajectoryConfig addConstraints(List extends<br TrajectoryConstraint> constraints)	Implemented differently, can't duplicate.			
								public double getStartVelocity()	can use cluster unpack			
								public TrajectoryConfig setStartVelocity(double				
								startVelocityMetersPerSecond)				
								public double getEndVelocity() public TrajectoryConfig setEndVelocity(double	can use cluster unpack			
								endVelocityMetersPerSecond)				
								public double getMaxVelocity()	can use cluster unpack			
								public double getMaxAcceleration()	can use cluster unpack			
								public List <trajectoryconstraint> getConstraints()</trajectoryconstraint>	Implemented differently, can't duplicate.			
								public boolean isReversed()  NOTE ADD OTHER "SET" ROUTINES FOR OTHER	can use cluster unpack			
								CONTRAINTS HERE, SINCE NEW CONTRAINTS ARE SPECIFIC AND NOT GENERIC.				
	lemented	sumented	WPILIB	nu Item	ecution Optimized	Test Routine Sample Program				de Review	t Program	or Checking
	lmp	ООС	Not	Mer	Exe	Zar Sar	VI Name	Function Prototype	Notes	80	Test	Err
TRAJECTORY GENERATE	X	X		Χ			TrajectoryGenerate_Make_Cubic_CtrlVect.vi	initial. List <translation2d> interiorWaypoints. Spline.ControlVecto</translation2d>	uses cubic splines r			
	X	Х		X			TrajectoryGenerate_Make_Cubic.vi	end, TrajectoryConfig config ) public static Trajectory generateTrajectory( Pose2d start, List <translation2d> interiorWaypoints, Pose2d end,</translation2d>	uses cubic splines			
<u> </u>	X	X	X	Χ			TrajectoryGenerate_Make_Generic.vi	TrajectoryConfig config ) Helper to bring these all together	Use this one!!!			
	X	X		X			TrajectoryGenerate_Make_Quintic_CtrlVect.vi	public static Trajectory generateTrajectory( ControlVectorList controlVectors, TrajectoryConfig config)	uses quintic splines			
		Χ	X	Χ			TrajectoryGenerate_Make_Quintic_Weighted.vi	, , , , , , , , , , , , , , , , , , , ,	New 2762			
	X			X			TrajectoryGenerate_Make_Quintic.vi	public static Trajectory generateTrajectory(List <pose2d> waypoints, TrajectoryConfig config)</pose2d>	uses quintic splines			
	X	X		X			TrajectoryGenerate_splinePointsFromSplines.vi	public static List <posewithcurvature> splinePointsFromSplines(Spline[] splines)</posewithcurvature>				
	mplemented	Documented	Not WPILIB	Jenu Item	Execution Optimized	Test Routine Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
TRAJECTORY GENERATE (Control Vector)	-		<	~	W W	<u>~</u> σ.	y viivallie	public ControlVectorList(int initialCapacity)	may not need, just data		7	Щ
								public ControlVectorList(III IIIIIIIIICapacity) public ControlVectorList()	may not need, just data			

Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. public ControlVectorList(Collection<? extends may not need, just data Spline.ControlVector> collection) Menu Item Function Prototype Notes TRAJECTORY PARAMETERIZE X X TrajectoryParam calcStuffFwd.vi Χ Χ TrajectoryParam calcStuffRev.vi X Χ TrajectoryParam enforceAccel.vi private static void enforceAccelerationLimits(boolean reverse, his routines needs to be changed hen new constraints are added. List<TrajectoryConstraint> constraints, ConstrainedState state)  $X \mid X$ Χ No TrajectoryParam enforceVelocity.vi This routines needs to be changed hen new constraints are added. XX public static Trajectory TrajectoryParam\_timeParam.vi X timeParameterizeTrajectory( List<PoseWithCurvature> points. List<TrajectoryConstraint> constraints, double startVelocityMetersPerSecond, double endVelocityMetersPerSecond, double maxVelocityMetersPerSecond, double
maxAccelerationMetersPerSecondSq, boolean reversed) Test Routine Menu Item VI Name Function Prototype Notes TRAJECTORY PARAMETERIZE CONSTRAINED STATE X ConstrainedState New.vi ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double maxAccelerationMetersPerSecondSq) X X X X X X X X X X X X X ConstrainedState SetMaxAccel.vi ConstrainedState SetMinAccel.vi ConstrainedState SetVelAccel.vi X X X X ConstrainedState SetVelocity.vi ConstrainedState() Item Function Prototype VI Name Notes TRAJECTORY UTIL X TrajectoryUtil\_fromPathWeaverJSON.vi public static Trajectory fromPathweaverJson(Path path) X Χ XX X TrajectoryUtil\_MakeWeightedWayPoint\_ENG.vi Χ Χ TrajectoryUtil\_MakeWeightedWayPoint.vi Χ Χ Χ Χ TrajectoryUtil toPathWeaverJSON.vi public static void toPathweaverJson(Trajectory trajectory, Path public static Trajectory deserializeTrajectory(String json) public static String serializeTrajectory(Trajectory trajectory) Menu Item VI Name Function Prototype Notes TRAPEZOID PROFILE X TrapProfConstraint\_New.vi TrapProfile Calculate.vi  $X \mid X$ 

Χ	Χ		No		TrapProfile_Direct.vi	Private, remove from menu
Χ	Χ	Χ	X		TrapProfile_Execute.vi	
Χ	Χ	X	X	SI	TrapProfile_Execute_AtGoal.vi	
Χ	Χ		X		TrapProfile_IsFinished.vi	
Χ	Χ		X		TrapProfile_New_DefInitial.vi	
X	Χ		X		TrapProfile_New.vi	
Χ	Χ		No		TrapProfile_ShouldFlipAcceleration.vi	Private, remove from menu
X	Χ		X		TrapProfile_TimeLeftUntil.vi	
X	Χ		X		TrapProfile_TotalTime.vi	
X	Χ		X		TrapProfState_Equals.vi	
Χ	Χ		X		TrapProfState New.vi	

· ·	X	X		^			TrapProGete Equals.vi	
l	Χ	_ X		Χ			TrapProfState_New.vi	
'=========								
TRAJECTORY CONSTRAINT								
'========					Q			
CENTRIPETAL ACCELERATION CONSTRAINT	X Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimize	Test Routine	VI Name  CentripetalAccelConstraint_getMaxVelocity.vi  public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)  CentripetalAccelConstraint_getMinMaxAccel.vi  public MinMax	Notes
	^			^			getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters,	
							double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		Χ	SI		CentripetalAccelConstraint_New.vi public CentripetalAccelerationConstraint(double maxCentripetalAccelerationMetersPerSecondSq)	Can use cluster pack for now
DIFF DRIVE KINEMATIC CONSTRAINT	X Implemented	X Documented	Not WPILIB	X Menu Item	So Execution Optimized	Test Routine	VI Name  DiffDriveKinematicsConstraint_getMaxVelocity.vi  DiffDriveKinematicsConstraint_getMaxVelocity.vi  DiffDriveKinematicsConstraint_getMinMaxAccel.vi  DiffDriveKinematicsConstraint_getMinMaxAccel.vi  DiffDriveKinematicsConstraint_netMinMaxAccel.vi  DiffDriveKinematicsConstraint_Netw.vi  DiffDriveKinematicsConstraint_Netw.vi  DiffDriveKinematicsConstraint_Netw.vi  DifferentialDriveKinematics kinematics, double maxSpeedMetersPerSecond)	Notes
DIFF DRIVE VOLTAGE CONSTRAINT	X Implemented	X Documented	Not WPILIB	X Menu Item	Secution Optimized	st Rou	VI Name  DiffDriveVoltageConstraint_getMaxVelocity.vi  public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)  DiffDriveVoltageConstraint_getMinMaxAccel.vi  public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)  DiffDriveVoltageConstraint_New.vi  public DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics, double	Notes

JERK CONSTRAINT	/ / Implemented	Documented	X Not WPILIB	Menu Item	Execution Optimized	Test Routine		VI Name  JerkConstraint_getMaxVelocity.vi  JerkConstraint_getMinMaxAccel.vi  JerkConstraint New.vi	Function Prototype  Routine exists, it is just a shell  Routine exists, it is just a shell	Notes FUTURE FUTURE FUTURE FUTURE			
l	/		X		SI			JerkConstraint_New.vi	Routine exists, it is just a shell	FUTURE			
MECANUM DRIVE KINEMATICS CONSTRAINT	X X Implemented	X X Documented	Not WPILIB	X   Menu Item	Execution Optimized	Test Routine		VI Name  MecaDriveKinematicsConstraint_getMaxVelocity.vi  MecaDriveKinematicsConstraint_getMinMaxAccel.vi	Function Prototype	Notes			
	$\hat{X}$	$\frac{\hat{x}}{X}$		X	SI			MecaDriveKinematicsConstraint_getwinMaxAccer.vi					
	. Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine		VI Name	Function Prototype	Notes			
SWERVE DRIVE KINEMATICS CONSTRAINT	X	X		X				SwerveDriveKinematicsConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double				
	X	X		X				SwerveDriveKinematicsConstraint_getMinMaxAccel.vi	velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)				
	Χ	Χ		X	SI			SwerveDriveKinematicsConstraint_New.vi	Newpublic SwerveDriveKinematicsConstraint(final SwerveDriveKinematics kinematics, double maxSpeedMetersPerSecond)	Can use cluster pack for now			
TDA IFOTODY CONOTRAINT													
TRAJECTORY CONSTRAINT Interface class - no	thing	done	(not no	eded"	)								
monace class - no	unig	uonic (	1100110	oucu)									
					iized		,						

TRAJECTORY CONSTRAI

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimi	Test Routine	Sample Program	VI Name	Function Prototype	Notes
RAINT (Min Max)	X	X		X	SI			Constraint_MinMax_New.vi	Constraint_MinMax_New	
	Χ	Χ		X	SI			Constraint MinMax NewMinMax VI	Constraint MinMax New	

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UTILITY

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nd time	interp	olatab	ole rou	ıtines.						
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
UTIL	Χ	Χ	Χ	X	SI			Util ApproxEqual.vi	, , , , , , , , , , , , , , , , , , ,	
	Χ	Χ	Χ	Χ				Util Array PoseWCurv to XY.vi		
	Χ	Χ	Χ	Χ	SI			Util_CalcDist.vi		
	Χ	Х	Χ	Χ	SI			Util_GetLibraryVersion.vi		
	Χ	X	Χ	Χ	SI			Util_GetLibUsage.vi		
	Х	Х	Х	Х				Util_GetTime.vi		Once tested completely, this should be optimized!
	Χ	Х	Χ	No	N/A			Util_LibraryGlobals.vi		Global Variables – no block diag.
	Χ	Χ	Χ	X				Util Trajectory Absolute To Relative.vi		
	Χ	X	Χ	X				Util_Trajectory_ReadFile.vi		
	Χ	Χ	Χ	X				Util_Trajectory_to_XY.vi		
	Χ	Χ	Χ	No				Util_Trajectory_WriteFile_Config.vi		internal
	Χ	Χ	Χ	No				Util_Trajectory_WriteFile_OneState.vi		internal
	Χ	Χ	Χ	X				Util_Trajectory_WriteFile_PathFinder.vi		
	Χ	Χ	Χ	No				Util_Trajectory_WriteFile_PathFinderConfig.vi		internal
	Χ	Χ	Χ	X				Util_Trajectory_WriteFile_Pathweaver.vi		
	Χ	Χ	Χ	No				Util_Trajectory_WriteFile_States.vi		internal
	Χ	Χ	Χ	No				Util_Trajectory_WriteFile_WayPoints.vi		internal
	Χ	Χ	Χ	Χ				Util_Trajectory_WriteFile.vi		
	Χ	Χ	Χ	X				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	X				Util_DispWaypoint_To_QuinticInput.vi		
	Χ	Χ	X	Χ				Util_DispWeightedWaypiont_Eng_To_WeightedWaypoint		
	Χ	Χ	X	No				Util_DispWeightedWayPoint_To_WeightedWayPoint.vi		Sorry about the confusing name

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CONVERSIONS '========

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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name F	Function Prototype	Notes
CONV	Χ	Χ	Χ	Χ	SI			Conv_AngleDegrees_Heading.vi	· · · · · · · · · · · · · · · · · · ·	
	Χ	Χ	Χ	Χ	SI			Conv_AngleRadians_Heading.vi		
	Χ	Χ	Χ	X	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	X	Χ	SI			Conv_Heading_AngleRadians.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Inches_Meters.vi		
	Χ	Χ	X	X	SI			Conv_Kilograms_Pounds.vi		
	Χ	Χ	Χ	X	SI			Conv_Meters_Feet.vi		
_	X	X	X	X	SI			Conv_Meters_Inches.vi		
	X	X	X	X	SI			Conv_Pose2d_SI_Eng.vi		
-	X	X	X	X	SI			Conv_Pounds_Kilograms.vi		
	X	X	X	X	SI			Conv_Radians_Deg.vi		
	X	X	X	X	SI			Conv_Radians_Rotations.vi		
	X	X	X	X	SI			Conv_Rotations_Deg.vi		
Į	X	Χ	X	X	SI			Conv_Rotations_Radians.vi		

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	/	XX	SI	Conv_Yards_Meters.vi	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name Function	on Prototype	Notes
UNITS	Χ	Χ		Χ	SI			Units_DegreesToRadians.vi		
	Χ	Χ		Χ	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		Χ	SI			Units_RotationsToDegrees.vi		
	Χ	Χ		Χ	SI			Units_RotationsToRadians.vi		
	Χ	Χ		X	SI			Units_SecondsToMilliseconds.vi		

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PATHFINDER UTIL

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

JAVA / C++ WPILIB EQUIVALENT

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

'=========

STATE SPACE MODEL

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

u ume	merp	Joiatable i	rouu	mes.					
	Χ	X		Χ	SI	DCMotor_GetRomiBuiltIn.vi			
	Χ	X		Χ	SI	DCMotor_GetVex775Pro.vi			
	Χ	X		Χ	SI	DCMotor_New.vi			
	Χ	X		Χ	SI	DCMotor_PickMotor.vi			

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

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

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

	Implemented	Mot World	Menu Item	Execution Optimi	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
EXTENDED KALMAN FILTER	X X	(	X	·		ExtendedKalmanFilter_Correct_OnlyUY.vi					
	X X	(	X	·		ExtendedKalmanFilter_Correct.vi		Just a shell, not functional!			
	X X	(	X	·		ExtendedKalmanFilter_GetP_Single.vi					
	X X	(	X	·		ExtendedKalmanFilter_GetP.vi					
	$X \mid \lambda$	(	X			ExtendedKalmanFilter_GetXHat_Single.vi					
	X X	(	X	·		ExtendedKalmanFilter_GetXHat.vi					
	X X	(	X	·		ExtendedKalmanFilter_New.vi					
	X X	(	X			ExtendedKalmanFilter_Predict.vi					
	X X	(	X			ExtendedKalmanFilter_Reset.vi					
	X X	(	X			ExtendedKalmanFilter_SetP.vi					

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FRC LabVIEW Trajectory Library – VI Implementation Revision 2.X 5/2/2022 – added implicit model follower and time	LIST e inte	rnolata	able routi	nes				<u> </u>				
Trovision 2.70 0/2/2022 added implior model follower and time	X	X		X			ExtendedKalmanFilter_SetXHat_Single.vi					
	X	X		X			ExtendedKalmanFilter_SetXHat.vi					
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	Implementea	nted	118	3	5	rest Routine				viev	gran	ecki
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	nple	Documente	Vot WPILIE	Menu Item		lest Kol	VI Name	Function Prototype	Notes	Code	est	Error
KALMAN FILTER				X .		<u> </u>	KalmanFilter_Correct.vi	i unction i rototype	Notes			Щ
	X	Χ		X			KalmanFilter_GetK					
	X			X X			KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat					
	X			X	j	X	KalmanFilter_GetXHaT_Single					
	X	Χ		X	)	X	KalmanFilter_New.vi					
	X			X X	(	X	KalmanFilter_Predict.vi KalmanFilter Reset.vi				-	
	X		+	X			KalmanFilter_Reset.vi KalmanFilter_SetXHat					
	X			Х	)	X	KalmanFilter_SetXHat_Single					
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	Jmp	Doc			) I	Se /		Function Prototype	Notes	Code	Test	Erre
KALMAN FILTER LATENCY COMPENSATOR				X			KalmanFilterLatencyComp_AddObserverState.vi					
	X	X		X			KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.	VI				
	X	X		Х			KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKI	vi				
	X	X	+	X			KalmanFilterLatencyComp_FindClosestMeasurement.vi					
	X	Χ		X			KalmanFilterLatencyComp_New.vi					
	X	X	+	X			KalmanFilterLatencyComp_Observer_New.vi KalmanFilterLatencyComp_Reset.vi					
				Λ <u> </u>			KaimanFilterLatericyComp_Reset.vi					
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MECANUM DRIVE POSE ESTIMATOR		<u>~</u> ~_	<del></del>	ع ز	<u> </u>	3 4	VI Name  MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi	Function Prototype	Notes	Š		<u> </u>
MECANUM DRIVE POSE ESTIMATOR		X	+	X			MecaDrivePoseEst_AddVisionMeasurement.vi					
	X	X		Χ			MecaDrivePoseEst_GetEstimatedPosition.vi					
	X		+	No No			MecaDrivePoseEst_Kalman_F_Callback.vi MecaDrivePoseEst_Kalman_H_Callback.vi					
	X		+ + + '	X			MecaDrivePoseEst_Raiman_n_Caliback.vi  MecaDrivePoseEst_New.vi					
	X	X		X			MecaDrivePoseEst_ResetPosition.vi					
	X			X X			MecaDrivePoseEst_SetVisionMeasurementStdDevs.vi MecaDrivePoseEst_Update.vi				<u> </u>	
	X			X			MecaDrivePoseEst_UpdateWithTime.vi					
	X	X		No			MecaDrivePoseEst_VisionCorrect_Callback.vi					
	X	X	+	No			MecaDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi				<u> </u>	
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Revision 2.X 5/2/2022 – added implicit model follower and time		olatab	ole rou	tines.	_			<del></del>				
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	X			X			SwerveDrivePoseEst_Kalman_H_Callback.vi					
	X			X			SwerveDrivePoseEst New.vi					
	X			Х			SwerveDrivePoseEst_ResetPosition.vi					
	X			X			SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi					
	X			X			SwerveDrivePoseEst_Update.vi					
				X			SwerveDrivePoseEst_UpdateWithTime.vi					
	X			X			SwerveDrivePoseEst_VisionCorrect_Callback.vi					
	X	X		X			SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi					
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UNSCENTED KALMAN FILTER	X	×		X			UnscentedKalmanFilter_Correct_OnlyUY.vi					
	X	^		X			UnscentedKalmanFilter Correct OnlyUYR.vi					
				X			UnscentedKalmanFilter Correct.vi					
				X			UnscentedKalmanFilter_GetP_Single.vi					
	X			X			UnscentedKalmanFilter GetP.vi					
	X			X			UnscentedKalmanFilter_GetXHat_Single.vi					
	X			X			UnscentedKalmanFilter GetXHat.vi					
				Х			UnscentedKalmanFilter_New_Default.vi					
	X			X			UnscentedKalmanFilter_New_FuncGroup.vi					
	X			X			UnscentedKalmanFilter_New.vi					
		Χ		X			UnscentedKalmanFilter_Predict.vi					
				X			UnscentedKalmanFilter_Reset.vi					
	X	X		X			UnscentedKalmanFilter_SetP.vi					
	X			X			UnscentedKalmanFilter_SetXHat_Single.vi					
	X			X			UnscentedKalmanFilter_SetXHat.vi					
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DIFFERENTIAL DRIVE ACCELERATION LIMITE	$\frac{X}{X}$		<del> </del>	X		X	DiffDrvAccelLimit_Calculate.vi DiffDrvAccelLimit_New.vi					
	nted	ited		tem >	ion Optimized		PurpryAccelTimit_idem.vi			Review	rogram	1
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	Χ			Χ		Χ	ImplModelFollow_GetU_Single.vi					
	X		<del> </del>	X		X	ImplModelFollow_New.vi					
	X	_		X		X	ImplModelFollow_New_Plant.vi ImplModelFollow Reset.vi					
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	X		+	X			LinearPIntInvFF Calculate.vi					
	Χ			Χ		$\Box$	LinearPIntInvFF_GetR_Single.vi					
	X	_		X		$\rightarrow$	LinearPIntInvFF_GetR.vi LinearPIntInvFF_GetUff_Single.vi					
	X			X			LinearPIntInvFF_GetUff.vi					
	X	X		Χ			LinearPIntInvFF_New_Plant.vi					
	X			X			LinearPIntInvFF_New.vi					
	X	X	+	X		$\longrightarrow$	LinearPIntInvFF_Reset_Initial.vi LinearPIntInvFF Reset Zero.vi					
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LINEAR QUADRATIC REGULATO	R X	X		X	Execution Optimized	Test Routine	VI Name  LinearQuadraticRegulator Calculate NextR.vi	Function Prototype	Notes	Code Review		
LINEAR QUADRATIC REGULATO	R X X	X X X		X	Execution		VI Name  LinearQuadraticRegulator_Calculate_NextR.vi  LinearQuadraticRegulator_Calculate.vi  LinearQuadraticRegulator_GetK Single.vi	Function Prototype	Notes  NOT ORIGINAL	Code Review		
LINEAR QUADRATIC REGULATO	X X X X	X X X X		X X X	Execution	X Test Routine	VI Name  LinearQuadraticRegulator_Calculate_NextR.vi  LinearQuadraticRegulator_Calculate.vi  LinearQuadraticRegulator_GetK_Single.vi  LinearQuadraticRegulator_GetK.vi	Function Prototype		Code Review		
LINEAR QUADRATIC REGULATO	X   X   X   X   X   X   X   X   X   X	X X X X		X X X	Execution		VI Name  LinearQuadraticRegulator_Calculate_NextR.vi  LinearQuadraticRegulator_Calculate.vi  LinearQuadraticRegulator_GetK_Single.vi  LinearQuadraticRegulator_GetK.vi  LinearQuadraticRegulator GetR Single.vi	Function Prototype		Code Review		
LINEAR QUADRATIC REGULATO	R	X X X X X X		X X X	Execution		VI Name  LinearQuadraticRegulator_Calculate_NextR.vi  LinearQuadraticRegulator_Calculate.vi  LinearQuadraticRegulator_GetK_Single.vi  LinearQuadraticRegulator_GetK.vi  LinearQuadraticRegulator_GetR_Single.vi  LinearQuadraticRegulator_GetR_Single.vi  LinearQuadraticRegulator_GetR.vi  LinearQuadraticRegulator_GetU_Single.vi	Function Prototype		Code Review		
LINEAR QUADRATIC REGULATO	R	X X X X X X X		X X X X X	Execution	X	VI Name  LinearQuadraticRegulator_Calculate_NextR.vi LinearQuadraticRegulator_Calculate.vi LinearQuadraticRegulator_GetK_Single.vi LinearQuadraticRegulator_GetK.vi LinearQuadraticRegulator_GetR_Single.vi LinearQuadraticRegulator_GetR.vi LinearQuadraticRegulator_GetU_Single.vi LinearQuadraticRegulator_GetU_Single.vi LinearQuadraticRegulator_GetU_Single.vi	Function Prototype	NOT ORIGINAL	Code Review		
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LINEAR QUADRATIC REGULATO	R	X X X X X X X X X		X X X X X	Execution	X	VI Name  LinearQuadraticRegulator_Calculate_NextR.vi LinearQuadraticRegulator_Calculate.vi LinearQuadraticRegulator_GetK_Single.vi LinearQuadraticRegulator_GetK.vi LinearQuadraticRegulator_GetR_Single.vi LinearQuadraticRegulator_GetR.vi LinearQuadraticRegulator_GetU_Single.vi LinearQuadraticRegulator_GetU_Single.vi LinearQuadraticRegulator_GetU_Single.vi	Function Prototype	NOT ORIGINAL  Routine exists, but it only has	Code Review		

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

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

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

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

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

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

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

FRC LabVIEW Trajectory Library – VI Implementation	l ist											
Revision 2.X 5/2/2022 – added implicit model follower and time		polatal	ble routi	ines.				_				
·							FlyWheelSim_New_LinSys_NoNoise		Future			
	X	X		X			FlyWheelSim_New_MOI.vi					
	X			X X			FlyWheelSim_SetInput.vi FlyWheelSim_SetState.vi					
	X			X			FlyWheelSim_Update.vi			+		
LINEAR SYSTEM SIM	X	X		X X X	Execution Optimized	Sample Program	VI Name LinearSystemSim_ClampInput.vi LinearSystemSim_GetCurrentDrawAmps.vi LinearSystemSim_GetOutput_Single.vi LinearSystemSim_GetOutput.vi	Function Prototype	Notes  DONT IMPLEMENT	Code Review	Test Program	Error Checking
	Χ	Χ		Χ			LinearSystemSim_New LinearSystemSim_New_NoNoise.vi					
	X	Х		Х			LinearSystemSim_SetInput_Array.vi		Doesn't use clamp ?	+		<u> </u>
	Χ	Χ		X			LinearSystemSim_SetInput_Single.vi		·			
	Χ			Χ			LinearSystemSim_SetInput.vi					
	X			X			LinearSystemSim_Setstate.vi					į
	X			X No			LinearSystemSim_Update.vi LinearSystemSim_UpdateX.vi					<u> </u>
	X	X		No			LinearSystemSim_UpdateY.vi					
SINGLE JOINT ARM SIM	X X X X X X X X X X X X X X X X X X X	X		X X X X X X X X X X X X X X X X X X X	Execution Optimized	Sample Program	VI Name  SngJntArmSim_EsitmateMOI.vi  SngJntArmSim_GetAngleRads.vi  SngJntArmSim_GetCurrentDraw.vi  SngJntArmSim_GetVelocityRadsPerSec.vi  SngJntArmSim_HasHitLowerLimit.vi  SngJntArmSim_HasHitUpperLimit.vi  SngJntArmSim_New.vi  SngJntArmSim_Rkf45_Func.vi  SngJntArmSim_SetInputVoltage.vi  SngJntArmSim_SetState.vi  SngJntArmSim_Update.vi  SngJntArmSim_UpdateX.vi  SngJntArmSim_WouldHitLowerLimit.vi  SngJntArmSim_WouldHitLowerLimit.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATRIX UTILITIES '========												
MAT BUILDER	× Implemented	× Documented	Not WPILIB		© Execution Optimized	Sample Program	VI Name MatBuilder Create.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	^_	_ ^	1	^	JI		watbulluci_Oreate.vi					
FRC_LabVIEW_Trajectory_Library_Routines.xlsx												Page 31 / 3

		X	10 100	X	SI		MatBuilder_Fill.vi					
							-					
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATRIX	Χ	Χ		X	SI		Matrix_AssignBlock.vi					
	Χ	Χ		Χ	SI		Matrix_Block.vi					
_	V	V		Χ	SI		Matrix_ChangeBoundsUnchecked.vi Matrix_Create.vi					
	X	X		_ X	31		Matrix Det.vi					
	X	X		X	SI		Matrix_Diag.vi					
				- , ,	<u> </u>		Matrix Div Scalar.vi		labview has function			
							Matrix ElementPower.vi					
	Χ	Χ		Χ	SI		Matrix_ElementSum.vi					
							Matrix_ElementTimes.vi					
					,		Matrix_Equals.vi					
	X	X		X	SI		Matrix_Exp.vi Matrix ExtractColumnVector.vi					
-		$\hat{X}$		X	SI		Matrix ExtractFrom.vi					
					, O,		Matrix ExtractMatrix.vi					
	X	X		X	SI		Matrix_ExtractRowVector.vi					
		Χ		Χ	SI		Matrix_Fill.vi					
							Matrix_Get.vi		labview has function			
	Χ	Χ		Χ	1		Matrix_Ident.vi		WPILIB calls this EYE			
_	X	V		V	SI		Matrix_Inv.vi					
	^	^			31		Matrix_IsEqual.vi Matrix_IsIdentical.vi					
	X	X		X	,		Matrix_LLTDecompose.vi					
							Matrix Max.vi					
							Matrix_MaxAbs.vi					
							Matrix_Mean.vi					
							Matrix_MinInternal.vi					
_							Matrix_Minus_Matrix.vi					
_	X	X		X	1		Matrix_Minus_Scalar.vi Matrix_NormF.vi					
-	^	^		^			Matrix NormIndP1.vi					
							Matrix_Plus_Matrix.vi					
							Matrix_Plus_Scalar.vi					
	Χ	Χ		Χ	1		Matrix_Pow.vi		THIS NEEDS WORK!!!!			
	Χ	Χ		Χ	SI		Matrix_SetColumn.vi					
	X	X		X	SI		Matrix_SetRow.vi	THERE ARE LOTS OF OTHER MATRIX FUNCTIONS THAT SHOULD BE INCLUDED HERE FOR ISOLATION.				
							Matrix Solve.vi	SHOOLD BE INCLUDED HEIZE FOR ISOLATION.				
							Matrix_Times_Matrix.vi					
							Matrix_Times_Scalar.vi					
							Matrix_Trace.vi					
_		Χ	X	X	SI		Matrix_Transpose.vi Matrix WithinTolerance.vi					
-	Χ			^			iviatrix_vvitriiir i olerance.vi					
	mplemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	VI Name			Code Review	t Program	Error Checking
	du,	200	Vot	Ver	ii Xe	Tes	VI Name	Function Prototype	Notes	80	Tes	Ξrrc
SIMPLE MATRIX	X	X		X	SI		SimpleMatrix_ExtractMatrix.vi		NOTE Matrix also has an ExtractMatrix with different calling parameters YUK.		17	<i>F</i>

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

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

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

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

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

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

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VISION
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Riccati Input Check.vi

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

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

Z	r and time	and time interpolatable routines.									
Type						İΖΘ		_			
TypeDef   Z						Ĭ.		ш			
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TypeDef   Z   X   X   X   MA		υe	Ę	\$	7	Ħ	αž	þ			
TypeDef   Z   X   X   X   MA		βd	ದ್ದ	7	eu	9	st	TE.			
T	_		Ğ		Ž	ш	<u>1</u> e	Š	VI Name	Function Prototype	Notes
T	TypeDef	Ζ	X	X	X	N/A			ARM FF.CTL		
				X		N/A			BANG BANG.CTL		
ONLINENCE FURC. TYPE CTL.   Colorate   Col		1									NOT USED. Should this he
Z		١,		^	^	14/7			DIOON-WANK_1 ONO_111 E.OTE		
Z		7	Y	Y	Y	Ν/Δ			CALLBACK FUNC TYPE CTI		deleted of abalidoffed : : :
Z	-										
Z	-										
Z											
Z X X X N A DCMOTOR TYPES, EMUNICIT. Z X X X X NA DCMOTOR SINGT. Z X X X X NA DEMONSTRATE SINGT. Z X X X NA DEMONSTRATE SINGT. Z X X X NA DEMONSTRATE SINGT. Z X X X NA DEMONSTRATE SINGT. Z X X X NA DEFENSE SINGT. Z X X X NA DIFF_DRIVE SINGT. Z X X X NA SINGT.			X	X							
2		Z	X	X	X	N/A			COORDINATE_SYSTEM.CTL		
2		Ζ	X	X	Χ	N/A			DCMOTOR TYPES ENUM.CTL		
2				X					DCMOTOR.CTL		
Z											
2	-										
Z	-										
Z	-										
Z											
Z											
Z		Ζ	_ X	Χ	X				DIFF_DRIVE_Kitbot_WheelSize_ENUM.ctl		
Z											
Z											
Z	-										
Z	-										
Z	-										
Z											
UTIL_WEIGHTED_WAYPOINIT.			X	X	Χ	NA					
Z		Z	X	X	Χ	NA			DISPLAY_WEIGHTED_WAYPOINT.ctl		New V1.5. was
Z											UTIL_WEIGHTED_WAYPOINIT.VI
Z											
Z		Z	X	X	Χ	N/A			ELEV FF.CTL		
Z	-										
Z	-										
Z	-		^								
Z	_										
Z											
Z		Z	X	X	X	N/A			FUNCTION_GENERATOR.ctl		
Z		Ζ	X	Χ	X	N/A			FUNCTION GENERATOR MATRIX.ctl		
Z											New 1/26/21
Z											11011 1/20/21
Z	-				$\hat{}$						
Z	-										
Z											
Z											
Z         X         X         N/A         KALMAN FILTER.Ctl            Z         X         X         X         N/A         LINEAR FILTER.CTL            Z         X         X         N/A         LINEAR FLANT INV.FF.ctl            Z         X         X         N/A         LINEAR QUADRATIC REGULATOR.ctl            Z         X         X         N/A         LINEAR SYSTEM_LOOP.ctl            Z         X         X         N/A         LINEAR SYSTEM_SIM.ctl            Z         X         X         N/A         LIV.DIFF_DRIVE_CTRL.ctl            Z         X         X         N/A         LIV.DIFF_DRIVE_CTRL.STATE_ENUM.ctl            Z         X         X         N/A         LIV.DIFF_DRIVE_CTRL.STA									KALMAN_FILTER_LATENCY_COMP_FUNC_GROUP.CTL		
Z         X         X         N/A         KALMAN_FILTER.Ctt		Z	X	X	X	N/A			KALMAN_FILTER_LATENCY_COMP.CTL		
Z											
Z									_		
Z         X         X         N/A         LINEAR_QUADRATIC_REGULATOR.ctl           Z         X         X         N/A         LINEAR_SYSTEM_LOOP.ctl           Z         X         X         N/A         LINEAR_SYSTEM_SIM.ctl           Z         X         X         N/A         LINEAR_SYSTEM.ctl           Z         X         X         N/A         LINEAR_SYSTEM.ctl           Z         X         X         N/A         LIV_DIFF_DRIVE_CTRL.ctl           Z         X         X         N/A         LIV_DIFF_DRIVE_CTRL.ctl           Z         X         X         N/A         LIV_UNICYCLE_CONTROLLER.CTL           Z         X         X         N/A         LIV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl           Z         X         X         N/A         LIV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl           Z         X         X         N/A         MECA_DRIVE_MINICIS.CTL           Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_DOSE_EST.CTL           Z         X         X         X         N/A         MECA_DRIVE_SPEEDS.CTL           Z         X         X	-										+
Z         X         X         N/A         LINEAR SYSTEM_LOOP.ctl           Z         X         X         N/A         LINEAR SYSTEM_SIM.ctl           Z         X         X         N/A         LINEAR SYSTEM_Ctl           Z         X         X         N/A         LINEAR SYSTEM_Ctl           Z         X         X         N/A         LINEAR SYSTEM_LOOP.ctl           Z         X         X         N/A         LINEAR SYSTEM_LOOP.ctl           LINEAR SYSTEM_LOOP.ctl         LINEAR SYSTEM_LOOP.ctl         LINEAR SYSTEM_LOOP.ctl           Z         X         X         N/A         LINEAR SYSTEM_LOOP.ctl           Z         X         X         N/A         LINEAR SYSTEM_LOOP.ctl         LINEAR SYSTEM_LOOP.ctl           Z         X         X         N/A         LINEAR SYSTEM_LOOP.ctl         LINEAR SYSTEM_LOOP.ctl           Z         X         X         N/A         LIV_UNICYCLE_CTRLETCL         LINEAR SYSTEM_LOOP.ctl           Z         X         X         N/A         MECA_DRIVE_CONTROLLER_INDUCT         LINEAR SYSTEM_LOOP.ctl           Z         X         X         N/A         MECA_DRIVE_CONTROLLER_INDUCT         LINEAR SYSTEM_LOOP.ctl           Z         X         X<	-										
Z         X         X         N/A         LINEAR_SYSTEM_SIM.ctl           Z         X         X         N/A         LINEAR_SYSTEM_ctl           Z         X         X         N/A         LTV_DIFF_DRIVE_CTRL_ctl           Z         X         X         N/A         LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl           Z         X         X         N/A         MECA_DRIVE_KINEMATICS.CTL           Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_POSE_EST.CTL           Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL	-										
Z         X         X         N/A         LINEAR_SYSTEM.ctl           Z         X         X         N/A         LTV_DIFF_DRIVE_CTRL.ctl           Z         X         X         N/A         LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_CTL           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl           Z         X         X         N/A         MECA_DRIVE_CONTROLLER_STATE_ENUM.ctl           Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_POSE_EST.CTL           Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL											
Z         X         X         N/A         LTV_DIFF_DRIVE_CTRL.ctl           Z         X         X         N/A         LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER.CTL           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl           Z         X         X         N/A         MECA_DRIVE_KINEMATICS.CTL           Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_POSE_EST.CTL           Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL		Ζ	X	X	Χ	N/A					
Z         X         X         N/A         LTV_DIFF_DRIVE_CTRL.ctl           Z         X         X         N/A         LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER.CTL           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl           Z         X         X         N/A         MECA_DRIVE_KINEMATICS.CTL           Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_POSE_EST.CTL           Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL		Ζ	X	X	X	N/A			LINEAR SYSTEM.ctl		
Z         X         X         N/A         LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl											
Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl           Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl           Z         X         X         N/A         MECA_DRIVE_KINEMATICS.CTL           Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_POSE_EST.CTL           Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL											
Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl	-										
Z         X         X         N/A         LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl           Z         X         X         X         N/A         MECA_DRIVE_KINEMATICS.CTL           Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_POSE_EST.CTL           Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL	-										
Z         X         X         N/A         MECA_DRIVE_KINEMATICS.CTL           Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_POSE_EST.CTL           Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL											
Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_POSE_EST.CTL           Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL											
Z         X         X         N/A         MECA_DRIVE_ODOMETRY.CTL           Z         X         X         N/A         MECA_DRIVE_POSE_EST.CTL           Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL		Z									
Z         X         X         N/A         MECA_DRIVE_POSE_EST.CTL           Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL	Ī	Ζ	X	Χ		N/A			MECA_DRIVE_ODOMETRY.CTL		
Z         X         X         N/A         MECA_WHEEL_SPEEDS.CTL           Z         X         X         N/A         MEDIAN_FILTER.CTL											
Z X X X N/A MEDIAN_FILTER.CTL			X								
	-										
	L		٨	Λ	Λ	IV/A			INIEUNE OOALED OIGINIA LI 19'CII		

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