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

VI / CTL Totals
VI Total (X)
CTL Total (Z)
VI Shell Total (I)
CTRL Shell Total (I)

Doc completed Pct 98.91% Optimization Pct 56.65%

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

'======== BASE

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ANALOG DELAY [X Implemented	X Documented	X Not WPILIB	X Menu Item	- Execution Optimized	Test Routine Sample Program	VI Name AnalogDelay.vi	Function Prototype	Notes Similar to interpolated tree map	Code Review	Test Program	Error Checking
BUMPLESS TRANSFER [× Implemented	Documented	X Not WPILIB	X Menu Item	Execution Optimized	Test Routine Sample Program	VI Name BumplessTransfer_Execute.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
FUNCTION GENERATOR	Implemented	X X Documented	Not WPILIB	X X X Menu Item	1	Test Routine Sample Program		Function Prototype	Notes Similar to interpolated tree map	Code Review	Test Program	Error Checking
FUNCTION GENERATOR MATRIX	X Implemented	X X Documented	X X Not WPILIB	X Menu Item	- Execution Optimized	Test Routine Sample Program	VI Name FunctionGeneratorMatrix_Add.vi FunctionGeneratorMatrix_Calculate.vi	Function Prototype	Notes Similar to interpolated tree map Similar to interpolated tree map	Code Review	Test Program	Error Checking

ous routines		1	_	_	_			I	1			
	Χ	X	X	X	SI		FunctionGeneratorMatrix_New.vi		Similar to interpolated tree map			
LEADLAG	Implemented	Documented	Not WPILIB		Execution Optimized	Test Routine	Sample Program Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
LEAD LAG	Χ		X	X			LeadLag_Execute.vi					
LINEAR FILTER	X	X X Documented	Not WPILIB	X X X	SI X	Test Routine	VI Name LinearFilter_BackwardFiniteDifference LinearFilter_Calculate.vi LinearFilter_CutoffFrequency.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	X	X	X				X LinearFilter_Execute.vi		Labview style helper			
	X X X X X X X X X	X X X X X X X X X X	X X X X	No X X X X X X X X X			LinearFilter_Factorial.vi LinearFilter_FiniteDifference.vi LinearFilter_HighPass.vi LinearFilter_HighPassBW1.vi LinearFilter_HighPassBW2.vi LinearFilter_LowPassBW1.vi LinearFilter_LowPassBW2.vi LinearFilter_MovingAverage.vi LinearFilter_New.vi LinearFilter_Reset.vi LinearFilter_ResetToValue.vi LinearFilter_SinglePoleIIR.vi		AN INTERNAL ROUTINE			
	X	X	X	X	X		LinearFilter TimeConst.vi					
MEDIAN FILTER	X X X Implemented	X X Documented	X Not WPILIB	X X X X	図 図 - X Execution Optimized		WedianFilter_ResetToValue.vi	Function Prototype	Notes Labview style helper	Code Review	Test Program	Error Checking
SLEW RATE FILTER	X X X X X	X X X	X	X X X X X X		Test Routine	VI Name SlewRateLimiter_Calculate.vi SlewRateLimiter_Close.vi X SlewRateLimiter_Execute.vi SlewRateLimiter_GetRate.vi SlewRateLimiter_New.vi SlewRateLimiter_NewInitialZero.vi SlewRateLimiter_Reset.vi SlewRateLimiter_SetRate.vi	Function Prototype	Notes Labview style helper	Code Review	Test Program	Error Checking

022 – added various routines					_							
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	ше	иe	ď	Item	ıti0	રુદ	<u>e</u>			Re	Program	Checking
	Implementea	Documented	Not WPILIB	Menu	Execution	Test Routine	Sample Prog			Code Reviev	st F	Error
				χ	Ě	7e	ა VI Name	Function Prototype	Notes	රි	Test	E
TIMEF			Χ	Χ			Timer_Close.vi		releases semaphore			
	X	Χ		Χ			X Timer_Get.vi					
	X	Χ		Χ			Timer_GetAndReset.vi					
			X	No			Timer_GetInternal.vi		Internal (private) only			
		X		X			X Timer_HasPeriodPassed.vi					
	X	X	X	X			X Timer_HasPeriodPassedOnce.vi X Timer New.vi					
		X		X			X Timer Reset.vi					
		X	Y	No			Timer ResetInternal		Internal (private) only			
		X	^	X			X Timer_Start.vi		internal (private) only			
		X		X			X Timer_Stop.vi					
		X	X	No			Timer_StopInternal.vi		Internal (private) only			
		,,		710			Timor_ctopintomai.vi		internal (private) emy			
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	ţec	tea	IB	2	õ	Test Routine	Prog			<i>i</i> ev	· Program	Checking
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	Implemente	Documentea	Not WPILI	ושנ	Execution	Ť.	Name			Code Revie	# D	9,
	g.	ŏ	Λοτ	Menu	Ä	Ze.	S VI Name	Function Prototype	Notes	Ö	Ze2	Error
TIME INTERPOLATABLE BOOLEAN			\overline{X}	\overline{X}	-1	T	TimeInterpBoolean_AddSample.vi	- undustri retetype	Update to use create matrix			
		X	X	No	1		TimeInterpBoolean_CleanUp.vi		Update to use create matrix			
	X		Χ	Χ	SI		TimeInterpBoolean_Clear.vi		<u> </u>			
	X		Χ	Χ	1		TimeInterpBoolean_GetSample.vi					
							TimeInterpBoolean_GetTimeForValue.vi					
	X	Χ	Χ	Χ	SI		TimeInterpBoolean_New.vi					
	X	Χ	X	X	SI		TimeInterpBoolean_SetMaxTime.vi					
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	þe	þ	m		Ö	e	ubc			≥	am	Checking
	Implementea	Documented	Not WPILIB	em		Test Routine	Sample Prog			Code Review	Test Progran	jec
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	θdι	700	<i>ot</i> 1	Menu Item	Execution	est	Turn and the second sec			oqe	est	Error
TIME INTERROL ATARLE BOURLE	==	<u>Ā</u>	<u> </u>	<u> </u>	<u>Ü</u>			Function Prototype	Notes		<u> </u>	<u> </u>
TIME INTERPOLATABLE DOUBLE	X	X	X	X			TimeInterpDouble_AddSample.vi		Update to use create matrix			
	X	X	X	NO	<u> </u>		TimeInterpDouble_CleanUp.vi TimeInterpDouble Clear.vi		Update to use create matrix			
	X	X X	^ X	^ X	JI I		TimeInterpDouble_Clear.vi TimeInterpDouble_GetSample.vi					
	X		X	^			TimeInterpoodsic_GetGampic.vi TimeInterpDouble_GetTimeForValue.vi					
		Х	X	Х	SI		TimeInterpDouble New.vi					
	X	X	X	Χ	SI		TimeInterpDouble SetMaxTime.vi					
				-			<u> </u>					
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					niz		E					
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	ıţe(tec	18	2	Õ.	tine	Prog			/jei	Irai	S.
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	Implementec		Not WPILIB	Menu	Execution	Test Routine	ର ଆଧିକ ଓ VI Name	Function Prototype	Notes	Code	Test	Error
TIME INTERPOLATABLE POSE2D	X	Χ	X	X	1		TimeInterpPose2d_AddSample.vi	· ·	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	Χ	X	Χ	I		TimeInterpPose2d_GetSample.vi					
							TimeInterpPose2d_GetTimeForValue.vi					
	X	X	X	X	SI		TimeInterpPose2d_New.vi					
	X	X	X	X	SI		TimeInterpPose2d_SetMaxTime.vi					

FRC LabVIEW Trajectory Library - VI Implementation List Revision 2.X 11/06/2022 – added various routines Function Prototype TIME INTERPOLATABLE ROTATION2D TimeInterpRotation2d AddSample.vi Update to use create matrix TimeInterpRotation2d_CleanUp.vi Update to use create matrix TimeInterpRotation2d_Clear.vi X X X X I TimeInterpRotation2d_GetSample.vi TimeInterpRotation2d_GetTimeForValue.vi TimeInterpRotation2d New.vi X X X X SI TimeInterpRotation2d_SetMaxTime.vi X X X X SI Function Prototype VI Name Notes WAIT ADJUST X WaitAdjust.vi Function Prototype Notes DIGITAL SEQUENTIAL LOGIC X X X X DigSeqLogic_Delay.vi Χ X X X DigSeqLogic_On_Delay.vi Χ DigSeqLogic_Off_Delay.vi X X X X X X X X X X X DigSeqLogic_One_Shot.vi DigSeqLogic_SR_Flip_Flop.vi Function Prototype VI Name Notes DEBOUNCER X Debouncer New.vi X X Χ Debouncer_Calculate.vi XX XX Debouncer Execute.vi XX No Debouncer Reset.vi XX No Debouncer HasElapsed.vi '======== CONTROLLER '========

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

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

	Χ	Χ	Χ	X				HolDrvCtrl Execute Trajectory.vi		Added 1/24/2022			
	Χ	Χ	Χ	X				HolDrvCtrl Execute.vi		Future			
	X	X		X	SI			HolDrvCtrl New.vi		Added 1/26/21			
	X	X	Χ	X				HolDrvCtrl PackExecuteSP.vi		133331,2021			
	X			X	 •			HolDrvCtrl PackPID.vi		Added 1/24/2022			
	X		X	X				HolDrvCtrl PackProfPID.vi		Added 1/24/2022			
	X	X		X	SI			HolDrvCtrl SetEnabled.vi		Added 1/26/21			
	X	X		X	SI			HolDrvCtrl SetTolerance.vi		Added 1/26/21			
l								TOIDIVOIII_OCTIOICIANOC.VI		Added 1/20/21			
PID AUTOTUNE	X X Implemented	Documented	X X Not WPILIB	No No No X	Execution Optimized	Test Routine	Sample Program	VI Name PIDAutoTune_ClosedLoopStep.vi PIDAutoTune_Convert_Academic_To_NonInteracting.vi PIDAutoTune_OpenLoopStep.vi PIDAutoTune_SetTuningArguments.vi PIDAutoTune Step.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
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	mplemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program				Code Review	sst Program	Error Checking
r		Ğ	ž	Ž	<u> û</u>	_ _	ു	VI Name	Function Prototype	Notes	<u> </u>	4	<u>r</u>
PID CONTROLLER	X	Χ	X	X				PIDController_AdvCalculate_FF_Sp_Pv_Per.vi		Advanced PID			
	X	Χ	Χ	X				PIDController_AdvCalculate_FF_Sp_Pv.vi		Advanced PID			
	X	Χ	X	X			X	PIDController_AdvExecute.vi		Labview style helper. Advanced			
										PID			
	X	Χ		X	SI			PIDController_AtSetpoint.vi					
	X	X		X				PIDController_Calculate_PV.vi					
	X	Χ		X				PIDController_Calculate_SP_PV.vi					
	X	Χ		Χ	SI			PIDController_DisableContinousInput.vi					
	Χ	Χ		X	SI			PIDController EnableContinousInput.vi					
	X	Χ	Χ	X			Χ	PIDController Execute.vi		Labview style helper			
								PIDController GetContinuousError.vi		OBSOLETE – Removed			
	Χ	Χ		Х	SI			PIDController GetPeriod.vi		OBCCETE INCINICACE			
	X	X		X	SI			PIDController GetPID.vi					
	X	X		X	SI			PIDController GetPositionError.vi					
	X	X		X				PIDController GetSetpoint.vi					
				^									
	X	X			SI			PIDController_GetTolerance.vi					
	X	X		X				PIDController_GetVelocityError.vi					
	X	X		X		-	-	PIDController_IsContinuousInputEnabled.vi					
	X	X		X		-	-	PIDController_New.vi					
	X	X		X		-	-	PIDController_NewPeriod.vi					
	X		X	X		-	-	PIDController_Pack_AdvLimits.vi					
	X	X		X	SI	1		PIDController_Pack_AdvTuning.vi					
	X		Χ	X	SI			PIDController_Pack_ErrorTolerance.vi					
	Χ		Χ	X				PIDController_Pack_InputLimits.vi					
	Χ		Χ					PIDController_Pack_Tuning.vi					
	X	Χ		X				PIDController_Reset.vi					
	X	Χ		X	SI			PIDController_SetD.vi					
	X	Χ	Χ	X	SI			PIDController_SetDerivativeFilter.vi		Advanced PID			
	Χ	X	X	No				PIDController_SetFeedForward_OBSOLETE_DELETE.vi		Advanced PID, Obsolete – DELETE			
	X	X	X	No				PIDController_SetFFGain_OBSOLETE_DELETE.vi		Advanced PID, Obsolete – DELETE			
	У	X		Y	SI			PIDController_Setl.vi					
	^	^		^	JI			PIDController_SetInputRange.vi	+	OBSOLETE – Removed			
	Χ	Х		Χ	SI			PIDController_SetInputRange.vi		ODGOLL I E - Mellioved			
	X		X	X	SI			PIDController SetOutputLimits.vi		Advanced PID			
			^				-	PIDController SetOutputLimits.vi		Auvaliced FID			
	X	X	X	X	SI	-	-	PIDController SetPeriod.vi					
	Λ.	٨	Λ	_ X	31	1		FIDController_SetPeriod.vi					

X X X X SI PIDController_SetPIDF.vi X X X SI PIDController_SetSetpoint.vi X X X SI PIDController_SetTolerance.vi		Advanced PID	
		Advanced i ib	
X X SI PIDController SetTolerance vi			
X X X OI I IDOUITION CI CONTROLLE CONTRO			
X X X SI PIDController_SetTolerancePan	ndV.vi		

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

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

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

boolean equals(other obj)

pose2d exp(twist2d twist)

POSE2D

XX

XX

XX

SI

X SI

XX

Pose2d Div.VI

Pose2d Exp.vi

Pose2d Equals.VI

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

outines					7.								
	nted	nted	7IB	8	n Optimized	tine	Sample Program				view	Program	Error Checking
	Implemented	Documented	Not WPILIB	Menu Item	Execution	Test Routine	nole F				Code Review	t Prog	or Che
	lmp	Doc	Not	Me	Exe	7es	Sar	VI Name	Function Prototype	Notes	S	Test	Err
ROTATION2D	X	Χ		X	SI			Rotation2d_CreateAngle.vi	rotation2d new(double value)				
		Χ		Χ	SI			Rotation2d_CreateAngleDegrees.vi	rotation2d fromDegrees(double degrees)	convert to radians then create			
	X	X		Χ	SI			Rotation2d_CreateAngleRotations.vi					
		X		Χ	SI			Rotation2d_CreateXY.vi	rotation2d new(double x, double y)				
		X		Х	SI SI		+	Rotation2d_Div.vi Rotation2d_Equals.vi	boolean equals(rotation2d other)				
			Χ	\dot{X}	SI		+-	Rotation2d_Equals.vi Rotation2d_GetAngleCosSin.vi	poolean equals(rotation2d other)	New 1/26/21			
		X		X	SI			Rotation2d_GetCos.VI	double getCos()	use cluster unpack			
	X	X		X	SI			Rotation2d_GetDegrees.VI	double getDegrees()	use cluster unpack, then convert to degree			
		Χ		Χ	SI			Rotation2d_GetRadians.VI	double getRadians()	use cluster unpack			
		X		X	SI		_	Rotation2d_GetRotations.vi	1. 11. 10: 0				
		X		X	SI	-	+	Rotation2d_GetSin.VI	double getSin()	use cluster unpack			
		X X		X	SI SI	-	-	Rotation2d_GetTan.VI Rotation2d Interpolate.vi	double getTan()	can calculate			
		X		X	SI			Rotation2d_Interpolate.vi Rotation2d_Minus.vi	rotation2d minus(rotation2d other)				
		X		\overline{X}	SI			Rotation2d Plus.vi	rotation2d plus(rotation2d other)				
		X		X	SI			Rotation2d RotateBy.vi	rotation2d rotateby(rotation2d other)				
	X	Χ		Χ	SI			Rotation2d_Times.vi	rotation2d times(double scalar)				
	X	Χ		Χ	SI			Rotation2d_UnaryMinus.vi	rotation2d unaryminus()				
									rotation2d new()	can use cluster constant			
	Implementea	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program) // Name	Function Dratetyna	Notes	Code Revieu	Test Progi	Error Checking
ROTATION3D		X	_<	<u> </u>	SI	_		VI Name Rotation3d_Create_AxisAngle.vi	Function Prototype	Notes	<u> </u>		Щ
		X		X	SI			Rotation3d_Create_Default.vi					
		Χ		Χ	SI			Rotation3d_Create_Quaternion.vi					
		X		X	1		-	Rotation3d_Create_InitialFinalVector.vi					
		X		X	SI			Rotation3d_Create_RollPitchYaw.vi Rotation3d_Create_RotMatrix.vi					
		\hat{x}		^	SI		+	Rotation3d_Div.vi					
		X		Χ	SI			Rotation3d Equals.vi					
			Χ	Χ	SI			Rotation3d_GetAxisAngle.vi					
		X		X	SI			Rotation3d_GetQuaternion.vi					
		X		X	SI SI			Rotation3d_GetXYZ.vi Rotation3d_Interpolate.vi					
		X		\overline{X}	SI		+	Rotation3d Minus.vi					
		X		X	SI			Rotation3d Plus.vi					
		Χ		Χ	SI			Rotation3d_RotateBy.vi					
		X		X	SI			Rotation3d_Times.vi					
		X		X	SI SI		-	Rotation3d_ToRotation2d.vi Rotation3d_UnaryMinus.vi					
		^			31			Notation3u_onaryiviinus.vi					
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program				Code Review	Test Program	Error Checking
TDANGEORISC			Ž_					VI Name	Function Prototype	Notes		76	<u>Ē</u>
TRANSFORM2D		X X		X	SI SI	-	-	Transform2d_Create_PosePose.vi Transform2d_Create_TransRot.vi	transform2d new(pose2d, pose2d) transform2d new(translation2d, rotation2d)				
	X	X		^	SI	1	+	Transform2d Div.vi	u ansionnea new (u ansiauonea, totalionea)				
			l l		<u> </u>			,					

	Χ	Χ		Χ	SI			Transform2d_Equals.VI	boolean equals(other transform2d)				
	X	Χ		X	SI			Transform2d_GetRotation.VI	rotation2d getRotation()	use cluster unpack			
	X	Χ		X	SI			Transform2d_GetTranslation.VI	translation2d getTranslation()	use cluster unpack			
	X	X	X	X	SI			Transform2d_GetXY.vi					
	X	X	Χ	X	SI			Transform2d_GetXYAngle.vi					
	X	X		X	SI			Transform2d_Inverse.vi	transform inverse()	new			
	X	X		X	Si			Transform2d_Plus.vi					
	Χ	Χ		Χ	SI			Transform2d_Times.vi	transform2d times(double scalar)				
									transform2d new()	can use cluster constant			
TRANSFORM3D	X	Documented X X X X X X X X X X X X X X X X X X X	X Not WPILIB	X X X X X X X X X X X X X X X X X X X	S S S S S S S S S S S S S S S S S S S	Test Routine		VI Name Transform3d_Create_Default.vi Transform3d_Create_Pose3dPose.3dvi Transform3d_Create_Trans3dRot3d.vi Transform3d_Div.vi Transform3d_Equals.VI Transform3d_GetRotation3d.VI Transform3d_GetTranslation3d.VI Transform3d_GetXYZ.vi Transform3d_Inverse.vi Transform3d_Plus.vi Transform3d_Times.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
TRANSLATION2D	X X X Implemented	X X Documented	Not WPILIB	X X Menu Item	ଓ ଓ Execution Optimized	Test Routine		VI Name Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi	Function Prototype translation2d new(double x, double y)	Notes	Code Review	Test Program	Error Checking
		X		X				Translation2d Equals.vi	boolean equals(translation other)				
	X	X		X	SI SI			Translation2d_Equals.vi Translation2d_GetAngle.vi	boolean equals(translation other)				
		X			SI SI SI			Translation2d_GetAngle.vi Translation2d_GetDistance.vi	boolean equals(translation other) double getDistance(translation2d other)				
	X X X	X X X		X X X	SI SI SI			Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI	double getDistance(translation2d other) double getNorm()	can use cluster unpack			
	X X X	X X X		X X X	SI SI SI SI			Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI	double getDistance(translation2d other)	can use cluster unpack can use cluster unpack			
	X X X X	X X X X	X	X X X X	SI SI SI SI SI			Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI	double getDistance(translation2d other) double getNorm() double getX()	can use cluster unpack			
	X X X X X	X X X X X	X	X X X X X	SI SI SI SI SI SI			Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI Translation2d_GetY.VI Translation2d_GetY.VI	double getDistance(translation2d other) double getNorm()				
	X X X X X X	X X X X X X	X	X X X X X X	\$I \$I \$I \$I \$I \$I \$I			Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI Translation2d_GetY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi	double getDistance(translation2d other) double getNorm() double getX() double getY()	can use cluster unpack			
	X X X X X X X	X X X X X X X	X	X X X X X X X	SI SI SI SI SI SI SI SI			Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI Translation2d_GetY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi Translation2d_Minus.vi	double getDistance(translation2d other) double getNorm() double getX() double getY() translation2d minus(translation2d other)	can use cluster unpack			
	X X X X X X X X	X X X X X X X	X	X X X X X X X	SI SI SI SI SI SI SI SI			Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI Translation2d_GetY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi Translation2d_Minus.vi Translation2d_Plus.vi	double getDistance(translation2d other) double getNorm() double getX() double getY() translation2d minus(translation2d other) translation2d plus(translation2d other)	can use cluster unpack			
	X X X X X X X X X	X X X X X X X X	X	X X X X X X X X	SI SI SI SI SI SI SI SI			Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI Translation2d_GetY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi Translation2d_Minus.vi Translation2d_Plus.vi Translation2d_RotateBy.vi	double getDistance(translation2d other) double getNorm() double getX() double getY() translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other)	can use cluster unpack			
	X X X X X X X X X X	X X X X X X X X X	X	X X X X X X X X X	SI SI SI SI SI SI SI SI			Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi Translation2d_Minus.vi Translation2d_Plus.vi Translation2d_RotateBy.vi Translation2d_Times.vi	double getDistance(translation2d other) double getNorm() double getX() double getY() translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar)	can use cluster unpack			
	X X X X X X X X X	X X X X X X X X	X	X X X X X X X X	SI SI SI SI SI SI SI SI			Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI Translation2d_GetY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi Translation2d_Minus.vi Translation2d_Plus.vi Translation2d_RotateBy.vi	double getDistance(translation2d other) double getNorm() double getX() double getY() translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar) translation2d unaryminus()	can use cluster unpack can use cluster unpack			
	X X X X X X X X X X	X X X X X X X X X	X	X X X X X X X X X	SI SI SI SI SI SI SI SI			Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi Translation2d_Minus.vi Translation2d_Plus.vi Translation2d_RotateBy.vi Translation2d_Times.vi	double getDistance(translation2d other) double getNorm() double getX() double getY() translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar) translation2d unaryminus() translation2d new()	can use cluster unpack can use cluster unpack can use cluster constant			
	X X X X X X X X X X	X X X X X X X X X	X	X X X X X X X X X	SI SI SI SI SI SI SI SI			Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi Translation2d_Minus.vi Translation2d_Plus.vi Translation2d_RotateBy.vi Translation2d_Times.vi	double getDistance(translation2d other) double getNorm() double getX() double getY() translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar) translation2d unaryminus()	can use cluster unpack can use cluster unpack			
	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Not WPILIB	X X X X X X X X X X X X X X X X X X X		Test Routine	Sample Program	Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi Translation2d_Minus.vi Translation2d_Plus.vi Translation2d_RotateBy.vi Translation2d_Times.vi Translation2d_UnaryMinus.vi	double getDistance(translation2d other) double getNorm() double getX() double getY() translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar) translation2d unaryminus() translation2d new()	can use cluster unpack can use cluster unpack can use cluster constant	Code Review	Test Program	Error Checking
TRANSLATION3D	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	WPILIB	X X X X X X X X X X X X X X X X X X X	S S S S S S S S S S	Test Routine	Sample Program	Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi Translation2d_Minus.vi Translation2d_Plus.vi Translation2d_RotateBy.vi Translation2d_Times.vi Translation2d_UnaryMinus.vi	double getNorm() double getX() double getY() translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar) translation2d unaryminus() translation2d new() translation2d div(double scalar)	can use cluster unpack can use cluster unpack can use cluster constant can multiply by 1/scalar	Code Review	Test Program	Error Checking
TRANSLATION3D	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	WPILIB	X X X X X X X X X X X X X X X X X X X		Test Routine	Sample Program	Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetXY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi Translation2d_Minus.vi Translation2d_Plus.vi Translation2d_RotateBy.vi Translation2d_Times.vi Translation2d_UnaryMinus.vi	double getNorm() double getX() double getY() translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar) translation2d unaryminus() translation2d new() translation2d div(double scalar)	can use cluster unpack can use cluster unpack can use cluster constant can multiply by 1/scalar	Code Review	Test Program	Error Checking

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

ajectory Library – VI Implem 2022 – added various routines	entation Li	SI								_				
2022 – added various routines														
		X	X		X	SI			ation3d_Div.vi					
		X	X		X	SI			ation3d_Equals.vi					
		X	X		X	SI			ation3d_GetDistance.vi					
		X	X		X	SI			ation3d_GetNorm.VI					
		X		Χ	X	SI			ation3d_GetXYZ.vi					
			X		X	SI			ation3d_Interpolate.vi					
		X	X		X	SI			ation3d_Minus.vi					
			X	_	X	SI			ation3d_Plus.vi					
			X		X	SI			ation3d_RotateBy.vi					
			X		X	SI			ation3d_Times.vi					
		X	X		X	SI			ation3d_ToTranslation2d.vi					
		Χ	Χ		Χ	SI		Transla	ation3d_UnaryMinus.vi					
	TWIST2D	X X	X X Documented	Not WPILIB	X X Menu Item	SI	Test Routine	Twist2	me 2d_Create.vi 2d_Equals.VI 2d_GetAll.VI	Function Prototype twist new(x, y, theta) boolean equals(obj other)	Notes	Code Review	Test Program	Error Checking
		٨	٨	^	Χ	SI		I WIST2	u_GetAll.VI					
	TWIST3D	X X	X Documented	X Not WPILIB	X X Menu Item	일 일 Execution Optimiz	X X Test Routine	Twist3	me Bd_Create.vi Bd_Equals.VI Bd_GetAll.VI	Function Prototype	Notes	Code Review	Test Program	Error Checking
						nized		u						
			Documented	Not WPILIB	Menu Item	Execution Optimiz	Test Routine	Sample Program IA ue N		Function Prototype	Notes	Code Review	Test Program	Error Checking
CHASSIS	SPEEDS		X			SI	T	Chassi	sisSpeeds_FromFieldRelativeChassisSpeeds.VI					
		X	X		X	SI			sisSpeeds_FromFieldRelativeSpeeds.VI	chassisspeeds fromFieldRelativeSpeeds(double x, double y, double angvel, rotation2d robotangle)				
		X	X	X	X	SI			sisSPeeds_GetXYOmega.vi					
		Χ	Χ		X	SI			sisSpeeds_New.vi	chassisspeeds new (double xvel, double yvel, double angvel)				
										chassisspeeds new ()	can use cluster constant			
		mplemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program IN ue V	me.	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE KIN	EMATICS	_	$\frac{D}{X}$	<_	<u>≥</u>	<u> </u>	\overline{X}		nematics_New.vi	diffDriveKine new(double trackWidth)	140162	0		Ā
DIFFERENTIAL DRIVE KIN			X	-+	X	X	X		nematics_new.vi nematics_toChassisSpeed.vi	chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds)				
			X		^	SI	X			diffDriveWheelSpeeds toWheelSpeeds(chassisSpeeds)				
		٨	٨		Χ	SI	Χ	ואזזוטן	nematics_toWheelSpeed.vi	unincrive vyriee is peeds (chassis speeds)				

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

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

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

SPLINE PARAMETERIZER X

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

double t0, double t1)

SplineParam Spline T0 T1.vi

public static List<PoseWithCurvature> parameterize(Spline spline,

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

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

public List<TrajectoryConstraint> getConstraints()

public double getEndVelocity()

Implemented differently, can't

can use cluster unpack

duplicate.

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

X

X

X

Χ

Χ

XX

TrajectoryConfig GetConstraints.vi

TrajectoryConfig_GetEndVelocity.vi

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

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

Implemented	ð			pəz							
	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	NI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
TRAJECTORY GENERATE X X	X		X			TrajectoryGenerate_Make_Cubic_CtrlVect.vi	initial List <translation2d> interiorWaypoints Spline ControlVector</translation2d>				
X	X		X			TrajectoryGenerate_Make_Cubic.vi	end, TrajectoryConfig config) public static Trajectory generateTrajectory(Pose2d start, List <translation2d> interiorWaypoints, Pose2d end, TrajectoryConfig config)</translation2d>	uses cubic splines			
XX	X	X	X			TrajectoryGenerate Make Generic.vi	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			
	X	X	X			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			
XX	X		X			TrajectoryGenerate_splinePointsFromSplines.vi	public static List <posewithcurvature> splinePointsFromSplines(Spline[] splines)</posewithcurvature>				
mplemented	Documented	Not WPILIB	Venu Item	Execution Optimized	Test Routine	E C C C C C C C C C C C C C C C C C C C	Function Prototype	Notes	Code Review	Fest Program	Error Checking
ECTORY GENERATE (Control Vector)						y viivame	public ControlVectorList(int initialCapacity)	may not need, just data			
							public ControlVectorList()	may not need, just data			
							public ControlVectorList(Collection extends Spline.ControlVector collection)	may not need, just data			
mplemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	NI Name	Function Prototype	Notes	Code Review	Fest Program	Frror Checking
	$\frac{1}{X}$		No I	<u> </u>		TrajectoryParam calcStuffFwd.vi	i dilodoli i iototypo	140.00			

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

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TRAJECTORY CONSTRAINT

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X 11/06/2022 – added various routines										
===	þ	ø			Optimized	O.	gram			
	Implementec	Documente	Not WPILIB	Menu Item	Execution C	Test Routine	Sample Progr	√l Name	Function Prototype	Notes
CENTRIPETAL ACCELERATION CONSTRAINT	X	X		X				CentripetalAccelConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X				CentripetalAccelConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X	SI			CentripetalAccelConstraint_New.vi	public CentripetalAccelerationConstraint(double maxCentripetalAccelerationMetersPerSecondSq)	Can use cluster pack for no
	ted	ted (81	-	Optimized	ine	Program			
	mplemented	Documented	Not WPILIB	Menu Item	Execution	Test Routine	mple	V/I Nama	Function Prototyne	Notes
DIFF DRIVE KINEMATIC CONSTRAINT	$\overline{}$	X	_ <	X			S	VI Name DiffDriveKinematicsConstraint_getMaxVelocity.vi	Function Prototype public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	Notes
	X	X		X				DiffDriveKinematicsConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X	SI			DiffDriveKinematicsConstraint_New.vi	public DifferentialDriveKinematicsConstraint(final DifferentialDriveKinematics kinematics, double maxSpeedMetersPerSecond)	
					nized		E			
	pə;	pet	en.		Optii	ne	Progra			
	plement	cumen	t WPILI	enu Item	ecution	st Routi	mple			
	 Implemented		Not WPILIB	Menu Item	Execution	Test Routine	Sample	VI Name		Notes
DIFF DRIVE VOLTAGE CONSTRAINT	· X	X	Not WPILI	X	Execution	Test Routi	Sample	DiffDriveVoltageConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	Notes
DIFF DRIVE VOLTAGE CONSTRAINT		X	Not WPILI	_<_	Execution	Test Routi	Sample		public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double	Notes
DIFF DRIVE VOLTAGE CONSTRAINT	· X	X	Not WPILI	X	Something the secution of the security of the	Test Routi	Sample	DiffDriveVoltageConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters,	Notes
DIFF DRIVE VOLTAGE CONSTRAINT	X	X	Not WPILI	X		Test Routi	Sample	DiffDriveVoltageConstraint_getMaxVelocity.vi DiffDriveVoltageConstraint_getMinMaxAccel.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double	Notes
DIFF DRIVE VOLTAGE CONSTRAINT	X	X	WPILIB	X	Optimized \Q	Routine	Program Sample	DiffDriveVoltageConstraint_getMaxVelocity.vi DiffDriveVoltageConstraint_getMinMaxAccel.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double	Notes
DIFF DRIVE VOLTAGE CONSTRAINT	X	X	Not WPILIB Not WPILIB	X	ptimized ©		Imple Program Sample	DiffDriveVoltageConstraint_getMaxVelocity.vi DiffDriveVoltageConstraint_getMinMaxAccel.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	Notes
DIFF DRIVE VOLTAGE CONSTRAINT	Implemented X X III	X	WPILIB	X	Optimized \Q	Routine	Sample Program Sample	DiffDriveVoltageConstraint_getMaxVelocity.vi DiffDriveVoltageConstraint_getMinMaxAccel.vi DiffDriveVoltageConstraint_New.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	

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

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

FRC_LabVIEW_Trajectory_Library_Routines.xlsx Page 21 / 39

dded various routines	mented	nented	/PILIB	ltem	ıtion Optimized	Routine	le Program				
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TRAJECTORY CONSTRAINT	Χ	Χ	Χ	Χ			TrajCons	traint_GetMaxVelocity.vi			
	Χ	Χ	Χ	Χ			TrajCons	traint_GetMinMaxAccel.vi			
	X	Χ	X	X			TrajCons	traint_GetType.vi			

X X Menu Item
Solve Execution Optimi TRAJECTORY CONSTRAINT (Min Max) X X X X Function Prototype
Constraint_MinMax_New Constraint_MinMax_New.vi Constraint_MinMax_NewMinMax.VI Constraint MinMax New

'======== UTILITY

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

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

Notes

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CONVERSIONS

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
CONV	Χ	Χ	Χ	Χ	SI			Conv_AngleDegrees_Heading.vi		
	Χ	Χ	Χ	Χ	SI			Conv_AngleRadians_Heading.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Centimeters_Meters.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Deg_Radians.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Deg_Rotations.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Feet_Meters.vi		
	Χ	Χ	Χ	Χ	SI			Conv_GyroDegrees_Heading.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Heading_AngleRadians.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Inches_Meters.vi		
	Χ	Χ	X	Χ	SI			Conv_Kilograms_Pounds.vi		
	Χ	Χ	X	Χ	SI			Conv_Meters_Feet.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Meters_Inches.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Pose2d_SI_Eng.vi		
	Χ	Χ	X	Χ	SI			Conv_Pounds_Kilograms.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Radians_Deg.vi		
	Χ	Χ	X	Χ	SI			Conv_Radians_Rotations.vi		
	X	X	X	Χ	SI			Conv_Rotations_Deg.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Rotations_Radians.vi		
	X	Χ	X	Χ	SI			Conv_Yards_Meters.vi		

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

'======== PATHFINDER UTIL

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

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

XXXXX PathfinderUtil_ToTrajectoryStates.vi

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

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

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

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

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

X 11/06/2022 – added various routines									
	XX	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	(DiffDrivePoseEst_Update.vi			
	X X					DiffDrivePoseEst_UpdateWithTime.vi			
	XX		(DiffDrivePoseEst_VisionCorrect_Callback.vi			
	$X \mid X$	λ	(DiffDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi			
EXTENDED KALMAN FILTER	X X X X X X X X X X X X X X X X X X X	Not WPILIB		Execution Optimized Test Routine	Sample Program		Code Review	Test Program	Error Checking
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					_	ExtendedKalmanFilter_SetXHat_Single.vi ExtendedKalmanFilter_SetXHat.vi			
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KALMAN FILTER	XX	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		Execution X Test Routi	Sample	VI Name Function Prototype Notes KalmanFilter_Correct.vi	Code Rev	Test Prog	ģ
KALMAN FILTER)))))))		Exec Test	Sample	VI Name Function Prototype Notes	Code Rev	Test Prog	Ď
KALMAN FILTER	X	Not WPILIB		X X X X Z Z Z Z	am	VI Name Function Prototype Notes KalmanFilter_Correct.vi KalmanFilter_GetK Single.vi KalmanFilter_GetK Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat Single KalmanFilter_Predict.vi KalmanFilter_Predict.vi KalmanFilter_Seset.vi KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat_Single VI Name Function Prototype Notes KalmanFilter_LatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.vi KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_New.vi KalmanFilterLatencyComp_Dobserver, New.vi	Code Review	Test Program	Ď
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	X			X				MecaDrivePoseEst_AddVisionMeasurement.vi MecaDrivePoseEst GetEstimatedPosition.vi					
	X	X		No				MecaDrivePoseEst_GetEstimatedPosition.vi MecaDrivePoseEst Kalman F Callback.vi					
	X	X		No				MecaDrivePoseEst_Kalman_H_Callback.vi					
		X		X				MecaDrivePoseEst New.vi					
		X		X				MecaDrivePoseEst_ResetPosition.vi					
	X	Χ		X				MecaDrivePoseEst SetVisionMeasurementStdDevs.vi					
		Χ		Χ				MecaDrivePoseEst_Update.vi					
		Χ		X				MecaDrivePoseEst_UpdateWithTime.vi					
	X	Χ		No				MecaDrivePoseEst_VisionCorrect_Callback.vi					
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SWERVE DRIVE POSE ESTIMATOR								SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi					
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		Χ		X				SwerveDrivePoseEst_Kalman_F_Callback.vi					
	X	X		X				SwerveDrivePoseEst_Kalman_H_Callback.vi					
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		X		X				SwerveDrivePoseEst_ResetPosition.vi SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi					
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		X		X				UnscentedKalmanFilter_Correct_OnlyUY.vi					
		Χ		Х				UnscentedKalmanFilter_Correct_OnlyUYR.vi					
	X	Χ		X				UnscentedKalmanFilter Correct.vi					
	X	Χ		X				UnscentedKalmanFilter_GetP_Single.vi					
		Χ		X				UnscentedKalmanFilter_GetP.vi					
		Χ		Χ				UnscentedKalmanFilter_GetXHat_Single.vi					
	X	Χ		Χ				UnscentedKalmanFilter_GetXHat.vi					
	X	Χ		Χ				UnscentedKalmanFilter_New_Default.vi					
		Χ		Χ				UnscentedKalmanFilter_New_FuncGroup.vi					
		Χ		X				UnscentedKalmanFilter_New.vi					
		X		X				UnscentedKalmanFilter_Predict.vi					
		X		X				UnscentedKalmanFilter_Reset.vi					
		X		X				UnscentedKalmanFilter_SetP.vi					
	X	X		X				UnscentedKalmanFilter_SetXHat_Single.vi					
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STATE SPACE CONTROL

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DIFFERENTIAL DRIVE ACCELERATION LIMITER		Χ		Χ	X		DiffDrvAccelLimit_Calculate.vi					
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	LinearQuadraticRegulator_GetU_Single.vi				
X X X	LinearQuadraticRegulator_GetU.vi				
X X X X		Routine e	exists, but it only has		
			aise matrix to power.		
X X X	LinearQuadraticRegulator_New_ELMS.vi				
X X X	LinearQuadraticRegulator_New_N.vi				
V V V	LinearQuadraticRegulator_New_Raw.vi				
	LinearQuadraticRegulator_New_SystemELMS.vi LinearQuadraticRegulator_New.vi				
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LINEAR SYSTEM X X X	LinearSystem_CalculateX.vi				
X X X I	LinearSystem_CalculateY.vi				
X X X SI	LinearSystem_GetA.vi				
X X X SI	LinearSystem_GetAElement.vi				
X X X SI	LinearSystem_GetB.vi				
X X X SI	LinearSystem_GetBElement.vi				
X X X SI	LinearSystem_GetC.vi LinearSystem_GetCElement.vi				
X X X SI	LinearSystem_GetD.vi				
	LinearSystem GetDElement.vi				
X X X SI	LinearSystem_New.vi				
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Continue	LinearSystemLoop_ClampInput.vi LinearSystemLoop_Correct.vi LinearSystemLoop_GetClampFunction.vi LinearSystemLoop_GetController.vi LinearSystemLoop_GetError_Single.vi	Function Prototype Notes	Code Revi	Test Prog	Error Cl
LINEAR SYSTEM LOOP	LinearSystemLoop_ClampInput.vi LinearSystemLoop_Correct.vi LinearSystemLoop_GetClampFunction.vi LinearSystemLoop_GetController.vi LinearSystemLoop_GetError_Single.vi LinearSystemLoop_GetError.vi	Function Prototype Notes	Code Revi	Test Prog	Error Cf
LINEAR SYSTEM LOOP	LinearSystemLoop_ClampInput.vi LinearSystemLoop_Correct.vi LinearSystemLoop_GetClampFunction.vi LinearSystemLoop_GetController.vi LinearSystemLoop_GetError_Single.vi LinearSystemLoop_GetError.vi LinearSystemLoop_GetFeedForward.vi	Function Prototype Notes	Code Revi	Test Prog	Error Cl
LINEAR SYSTEM LOOP	LinearSystemLoop_ClampInput.vi LinearSystemLoop_Correct.vi LinearSystemLoop_GetClampFunction.vi LinearSystemLoop_GetController.vi LinearSystemLoop_GetError_Single.vi LinearSystemLoop_GetError.vi LinearSystemLoop_GetFeedForward.vi LinearSystemLoop_GetNextR_Single.vi	Function Prototype Notes	Code Revi	Test Prog	Error Cl
LINEAR SYSTEM LOOP	LinearSystemLoop_ClampInput.vi LinearSystemLoop_Correct.vi LinearSystemLoop_GetClampFunction.vi LinearSystemLoop_GetController.vi LinearSystemLoop_GetError_Single.vi LinearSystemLoop_GetError.vi LinearSystemLoop_GetFeedForward.vi LinearSystemLoop_GetNextR_Single.vi LinearSystemLoop_GetNextR.vi	Function Prototype Notes	Code Revi	Test Prog	Error Ct
LINEAR SYSTEM LOOP	LinearSystemLoop_ClampInput.vi LinearSystemLoop_Correct.vi LinearSystemLoop_GetClampFunction.vi LinearSystemLoop_GetController.vi LinearSystemLoop_GetError_Single.vi LinearSystemLoop_GetError.vi LinearSystemLoop_GetFeedForward.vi LinearSystemLoop_GetNextR_Single.vi LinearSystemLoop_GetNextR.vi LinearSystemLoop_GetObserver.vi	Function Prototype Notes	Code Revi	Test Prog	Error Cl
LINEAR SYSTEM LOOP	LinearSystemLoop_ClampInput.vi LinearSystemLoop_Correct.vi LinearSystemLoop_GetClampFunction.vi LinearSystemLoop_GetController.vi LinearSystemLoop_GetError_Single.vi LinearSystemLoop_GetError.vi LinearSystemLoop_GetFeedForward.vi LinearSystemLoop_GetNextR_Single.vi LinearSystemLoop_GetNextR.vi LinearSystemLoop_GetObserver.vi LinearSystemLoop_GetObserver.vi LinearSystemLoop_GetU_Row.vi	Function Prototype Notes	Code Revi	Test Prog	Error Cf
LINEAR SYSTEM LOOP	LinearSystemLoop_ClampInput.vi LinearSystemLoop_Correct.vi LinearSystemLoop_GetClampFunction.vi LinearSystemLoop_GetController.vi LinearSystemLoop_GetError_Single.vi LinearSystemLoop_GetError.vi LinearSystemLoop_GetFeedForward.vi LinearSystemLoop_GetNextR_Single.vi LinearSystemLoop_GetNextR.vi LinearSystemLoop_GetObserver.vi	Function Prototype Notes	Code Revi	Test Prog	Error Cl

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

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

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

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

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

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

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

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

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

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

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

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

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

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MAT BUILDER	X X Implemented	X X Documented	Not WPILIB	X Menu Item	ed 9 Execution Optimized	Test Routine	N	VI Name MatBuilder_Create.vi MatBuilder_Fill.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATRIX [X Implemented	X Documented	Not WPILIB	X Menu Item	ত Execution Optimized	Test Routine		VI Name Matrix_AssignBlock.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	Χ	Χ		Х	SI		N	Matrix_Block.vi					
_					<u></u>		N	Matrix_ChangeBoundsUnchecked.vi					
	Χ	X		X	SI			Matrix_Create.vi Matrix_Det.vi					
	X	X		X	SI			Matrix_Diag.vi					
								Matrix Div Scalar.vi		labview has function			
							N	Matrix_ElementPower.vi					
	Χ	Χ		X	SI			Matrix_ElementSum.vi					
								Matrix_ElementTimes.vi					
				\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	,			Matrix_Equals.vi					
	X	X		X	SI			Matrix_Exp.vi Matrix ExtractColumnVector.vi					
	X	X		X	SI			Matrix ExtractFrom.vi					
					0,			Matrix ExtractMatrix.vi					
	Χ	X		X	SI			Matrix ExtractRowVector.vi					
	X	Χ		Χ	SI		N	Matrix_Fill.vi					
								Matrix_Get.vi		labview has function			
	Χ	X		X	1			Matrix_Ident.vi		WPILIB calls this EYE			
								Matrix_Inv.vi					
	Χ	X		X	SI			Matrix_IsEqual.vi Matrix_IsIdentical.vi					
	X	X		X	1			Matrix_LLTDecompose.vi					
								Matrix Max.vi					
								Matrix_MaxAbs.vi					
							N	Matrix_Mean.vi					
								Matrix_MinInternal.vi					
								Matrix_Minus_Matrix.vi					
	Χ			X	1			Matrix_Minus_Scalar.vi Matrix_NormF.vi					
	^				<i>'</i>			Matrix NormIndP1.vi					
								Matrix Plus Matrix.vi					
								Matrix_Plus_Scalar.vi					
	Χ	Χ		X	1		N	Matrix_Pow.vi		THIS NEEDS WORK!!!!			
	Χ	Χ		X	SI			Matrix_SetColumn.vi					
	X	X		X	SI		N		THERE ARE LOTS OF OTHER MATRIX FUNCTIONS THAT SHOULD BE INCLUDED HERE FOR ISOLATION.				
							N	Matrix_Solve.vi	GITOGED BE INCEODED HERE I ORTIOGENTION.				
							N	Matrix_Times_Matrix.vi					
								Matrix_Times_Scalar.vi					
								Matrix_Trace.vi					
-	X		V	X	SI			Matrix_Transpose.vi					
-	Χ	٨	Χ	X	-			Matrix_WithinTolerance.vi					
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### A PRINCIPLE NATION Principle Princ	· vi impiementation	LIST								_				
SIMPLE MATRIX X X X S Simple Mobile Edward Matrix Simple Mobile Simple Mobil	is routines													
## ATRIX HELPER X X X S				Not WPILIB	X Menu Item	Execution	Test Routine			Function Prototype	NOTE Matrix also has an ExtractMatrix with different calling	Code Review	Test Program	Error Checking
Section Prototype Notes Section Prototype														
MATRIX HELPER X				Not WPILIB	Menu Item	Execution	Test Routine			Function Prototype	Notes	Code Review	Test Program	Error Checking
VECTOR BUILDER X X X S Matrix-Helper Zero.vi	MATRIX HELPER				X	SI								
Notes Note		X	X	Χ	Χ	SI			MatrixHelper_MultCooerceBSize.vi					
VECTOR BUILDER		X	Χ	X	X	SI			MatrixHelper_Zero.vi					
	VECTOR BUILDER	R X	Χ	Not WPILIB	X	ଦ Execution	Test Routine		VecBuilder_1x1Fill.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
X		X			X	SI								
X		X			X	21								
X						SI								
X					X	SI								
						SI								
VecBuilder_10x1Fill.vi		X	X		X	SI								
VECTOR X X X X X St Vector Dot vi									VecBuilder_9x1Fill.vi					
VECTOR X X X X X St Vector Dot vi									VecBuilder_10x1Fill.vi					
VECTOR X X X S/ Vector Dot.vi		X	X	X	X	SI			VecBuilder_ArrayBy1Fill.vi					
VECTOR X X X SI Vector Dot.vi		Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
X X Si Vector_Norm.vi	VECTOR				X	SI			Vector Dot.vi	- unodon i fototypo	110100			F
		X	X		X	Si			Vector_Norm.vi					

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

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

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

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

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

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

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

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

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

Z	Z	X	X	NA	DISPLAY_WEIGHTED_WAYPOINT.ctl	New V1.5. was UTIL_WEIGHTED_WAYPOINIT.VI
Z	Z	X	Χ	N/A	ELEV FF.CTL	
Z	Z	X	X	N/A	ELEVATOR SIM.CTL	
Z	Ζ	X	X	N/A	EXTENDED KALMAN CORRECT FUNC GROUP.CTL	
Z		Χ	Χ	N/A	EXTENDED KALMAN FILTER.CTL	
Z	Ζ	Χ	Χ	N/A	FLYWHEEL_SIM.ctl	
Z	Ζ	Χ	Χ	N/A	FUNCTION_GENERATOR.ctl	
Z	Ζ	X	Χ	N/A	FUNCTION_GENERATOR_MATRIX.ctl	
Z	Ζ	X	X	N/A	HOLONOMIC_DRV_CTRL.CTL	New 1/26/21
Z	Z	X	X	N/A	TIME_INTERPOLATABLE_BOOLEAN.CTL	
Z	Z	X	X	N/A	TIME_INTERPOLATABLE_DOUBLE.CTL	
Z		X	X	N/A N/A	TIME_INTERPOLATABLE_POSE2D.CTL TIME_INTERPOLATABLE_ROTATION2D.CTL	
Z	Z	X	X	N/A	KALMAN FILTER LATENCY COMP FUNC GROUP.CTL	
Z	Z	X	X	N/A	KALMAN FILTER LATENCY COMP.CTL	
Z	Z	X	X	N/A	KALMAN FILTER.ctl	
Z	Ζ	Χ	X	N/A	LINEAR FILTER.CTL	
Z	Z	Χ	Χ	N/A	LINEAR_PLANT_INV_FF.ctl	
Z	Ζ	X	Χ	N/A	LINEAR_QUADRATIC_REGULATOR.ctl	
Ζ	Ζ	X	Χ	N/A	LINEAR_SYSTEM_LOOP.ctl	
Z	Z	X	Χ	N/A	LINEAR_SYSTEM_SIM.ctl	
Z	Z	X	X	N/A	LINEAR_SYSTEM.ctl	
<u>Z</u>	Z	X	X	N/A	LTV_DIFF_DRIVE_CTRL.ctl	
Z	Z	X	X	N/A N/A	LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl LTV_UNICYCLE_CONTROLLER.CTL	
N/A		N/A	^	N/A	LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl	OBSOLETE – Removed
Z	Z	X	X	N/A	LTV UNICYCLE CONTROLLER STATE ENUM.ctl	OBCOLL TE - Removed
Z	Z	X	X	N/A	MECA DRIVE KINEMATICS.CTL	
Z	Ζ	Χ	Χ	N/A	MECA_DRIVE_ODOMETRY.CTL	
Z	Ζ	Χ	Χ	N/A	MECA_DRIVE_POSE_EST.CTL	
Z	Ζ	X	Χ	N/A	MECA_WHEEL_POSITIONS.CTL	
Z	Z	X	Χ	N/A	MECA_WHEEL_SPEEDS.CTL	
Z	Z	X	X	N/A	MEDIAN_FILTER.CTL	
Z		X	X	N/A N/A	MERWE_SCALED_SIGMA_PTS.ctl OBSERVER_SNAP_LIST_ITEM.CTL	
Z	Z	X	X	N/A	OBSERVER_SNAPSHOT.CTL OBSERVER_SNAPSHOT.CTL	
Z	Z	X	X	N/A	PARAM STACK ITEM.CTL	
Z	Z	X	X	N/A	PARAM STACK.CTL	
Z	Ζ	X	Χ	N/A	PID_ADV_LIMITS.CTL	
Z	Ζ	Χ	Χ	N/A	PID_ADV_TUNING.CTL	
Z	Ζ	X	Χ	N/A	PID_CONTROLLER.CTL	
Z	Ζ		Χ		PID_ERROR_TOLERANCE.CTL	
Z	Z	X	X	N/A	PID_INPUT_LIMITS.CTL	
Z	Z	X	X	N/A	PID_TUNING.CTL	
Z		X	X	N/A N/A	POSE2D.CTL POSE3D.CTL	
Z	Z	X	X	N/A	POSE®CURVATURE.CTL	
Z	Z	X	X	N/A	PROFILED PID CONTROLLER.CTL	
Z	Z	X	X	N/A	QUATERNION.CTL	
Z	Ζ	X	Χ	N/A	RAMSETE_EXE_TUNING.CTL	
Ζ	Ζ	X	Χ	N/A	RAMSETE.CTL	
Ζ	Z	X	Χ	N/A	ROTATION2D.CTL	
Z	Z	X	X	N/A	ROTATION3D.CTL	
Z	Z	X	X	N/A	SIMPLE_MOTOR_FF.CTL	
Z	Z	X	X	N/A N/A	SINGLE_JOINT_ARM_SIM.CTL SLEW RATE LIMITER.CTL	
Z	Z	X	X	N/A N/A	SPLINE CTRL VECTOR.CTL	
Z	Z	X	X	N/A	SPLINE_CTL SPLINE.CTL	
Z	Z	X	X	N/A	SWERVE DRIVE KINEMATICS.CTL	
Z	Z	X	X	N/A	SWERVE_DRIVE_MODULE_POSITION.CTL	
Z	Ζ	Χ	Χ	N/A	SWERVE_DRIVE_MODULE_STATE.CTL	
Ζ	Ζ	X	Χ	N/A	SWERVE_DRIVE_ODOMETRY.CTL	
Z	Z	X	X	N/A	SWERVE_DRIVE_Pose_EST.CTL	
Z	Z	X	X	N/A	TIMER.CTL	
Ζ	Z	X	Χ	N/A	TRAJ_CONFIG.CTL	

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

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