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

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

> Test Routine VI / CTL Totals 923 866 307 876 462 43 12 VI Total (X) 824 CTL Total (Z) 99 VI Shell Total (/) 4 CTRL Shell Total (\)

2

Doc completed Pct 93.82% Optimization Pct 50.05%

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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Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. X No X X TimeInterpBoolean CleanUp.vi Update to use create matrix Χ TimeInterpBoolean Clear.vi Χ XX TimeInterpBoolean_GetSample.vi Χ XX TimeInterpBoolean_New.vi Test Routine Not WPILIB Execution VI Name Function Prototype Notes TIME INTERPOLATABLE DOUBLE X X X X No TimeInterpDouble AddSample.vi Update to use create matrix TimeInterpDouble CleanUp.vi Update to use create matrix Χ XX TimeInterpDouble_Clear.vi Χ XX TimeInterpDouble_GetSample.vi Χ XX TimeInterpDouble New.vi Execution Op X Not WPILIB Test Routine Function Prototype VI Name Notes TIME INTERPOLATABLE POSE X TimeInterpPose2d_AddSample.vi Update to use create matrix TimeInterpPose2d CleanUp.vi Χ Update to use create matrix Χ XX TimeInterpPose2d_Clear.vi Χ XX TimeInterpPose2d_GetSample.vi X $X \mid X$ TimeInterpPose2d New.vi Test Routine Not WPILIB Function Prototype Notes TIME INTERPOLATABLE ROTATION X XX TimeInterpRotation2d AddSample.vi Update to use create matrix Χ X No TimeInterpRotation2d_CleanUp.vi Update to use create matrix Χ XX TimeInterpRotation2d Clear.vi TimeInterpRotation2d GetSample.vi Χ X X Χ XX TimeInterpRotation2d New.vi Execution Optin Test Routine Not WPILIB Menu Item Function Prototype Notes DIG SEQ LOGIC X X XX DigSeqLogic_On_Delay.vi XX XX DigSeqLogic_Off_Delay.vi DigSeqLogic_One_Shot.vi $X \mid X \mid X \mid X$ DigSeqLogic_SR_Flip_Flop.vi $X \mid X \mid$ $X \mid X$

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Notes
This was short lived in WPILIB, but still useful here. Function Prototype X SI CONTROLLER UTIL X ControllerUtil_GetModulusError.vi

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X X X SI PIDController_SetOutputLimits.vi Advanced PID X X X SI PIDController_SetP.vi SI X X X SI PIDController_SetPiD.vi X X X SI PIDController_SetPIDF.vi X X X SI PIDController_SetPIDF.vi X X X SI PIDController_SetSetpoint.vi							OBSOLETE – Removed
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X X X SI PIDController_SetPeriod.vi X X X SI PIDController_SetPID.vi X X X SI PIDController_SetPIDF.vi Advanced PID X X X SI PIDController_SetSetpoint.vi		X	X	X	SI	PIDController_SetOutputLimits.vi	Advanced PID
X X SI PIDController_SetPID.vi X X X SI PIDController_SetPIDF.vi Advanced PID X X X SI PIDController_SetSetpoint.vi	X	X		X	SI	PIDController_SetP.vi	
X X X SI PIDController_SetPIDF.vi Advanced PID X X X SI PIDController_SetSetpoint.vi		X	X	X	SI	PIDController_SetPeriod.vi	
X X X SI PIDController_SetSetpoint.vi	X	X		X	SI		
	X	X	X	X	SI	PIDController_SetPIDF.vi	Advanced PID
X X X SI PIDController_SetTolerance.vi	X	X		X	SI		
	X	X		X	SI	PIDController_SetTolerance.vi	
X X SI PIDController_SetTolerancePandV.vi	X	X		X	SI	PIDController_SetTolerancePandV.vi	

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
RAMSETE	X	X		X	SI		Ramsete AtReference.vi	AtReference				
	X	X		X			Ramsete_Calculate_Trajectory.vi	calculate_trajectory				
	X	Χ		Χ			Ramsete_Calculate.vi	calculate				
	X	X	X	X			Ramsete_Diff_DO_Eng.vi					
	X	X	X	Χ	X		Ramsete_Diff_DO_SI.vi					
	X	X	X	X	1		Ramsete_Execute_ENG.vi	Use this one!!				
	X	X	X	X	SI		Ramsete_Execute_PackTuning_ENG.vi					
	X	X	X	X	SI		Ramsete_Execute_PackTuning.vi					
	X	X	X	X	1		Ramsete_Execute.vi					
	X	X		X	SI		Ramsete_New_B_Z.vi	new(b, zeta)				
	X	X		X	SI		Ramsete_New.vi	new				
	X	X		X	SI		Ramsete_SetEnabled.vi	SetEnabled				
	X	X		X	SI		Ramsete_SetTolerance.vi	SetTolerance				
	X	X		X	Χ		Ramsete_SINC.vi	sinc	internal			
					75							

Implemented Documented Not WPILIB	Menu Item	Execution Optii Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
SIMPLE MOTOR FEEDFORWARD $X \mid X \mid X$	X	SI	SimpleMotorFF_Calculate_CalcAccel.vi					
$X \mid X$	X		SimpleMotorFF_Calculate_NextV_Dt.vi					
XX	X	SI	SimpleMotorFF_Calculate.vi	public double calculate(double velocity, double acceleration)				
XX	X	SI	SimpleMotorFF_CalculateVelocityOnly.vi	public double calculate(double velocity)				
XX	X	X	SimpleMotorFF_MaxAchieveAccel.vi	public double maxAchievableAcceleration(double maxVoltage, double velocity)				
$X \mid X$	X	X	SimpleMotorFF_MaxAchieveVel.vi	public double maxAchievableVelocity(double maxVoltage, double acceleration)				
X X	Х	X	SimpleMotorFF_MinAchieveAccel.vi	public double minAchievableAcceleration(double maxVoltage, double velocity)				
X X	X	X	SimpleMotorFF_MinAchieveVel.vi	public double minAchievableVelocity(double maxVoltage, double acceleration)				
X X	X	SI	SimpleMotorFF_New.vi	public SimpleMotorFeedforward(double ks, double kv, double ka)				
				public SimpleMotorFeedforward(double ks, double kv)				

'====== GEOMETRY '======

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	 VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
POSE2D	Χ	X		X	SI		Pose2d_Equals.VI	boolean equals(other obj)				
	Χ	X		X	X		Pose2d_Exp.vi	pose2d exp(twist2d twist)				
	Χ	X		X	SI		Pose2d_getRotation.vi	rotation2d getRotation()	can also use cluster unpack			
	X	X		X	SI		Pose2d_getTranslation.vi	translation2d getTranslation()	can also use cluster unpack			
	X	X	X	X	SI		Pose2d_getXY.vi					
	X	X	X	X	SI		Pose2d_getXYAngle.vi					
	Χ	X		X	1		Pose2d_Interpolate.vi					
	Χ	X		X	X		Pose2d_Log.vi	twist2d log(pose2d end)				
	X	X		X	SI		Pose2d_Minus.vi	transform2d minus(pose2d other)				
	Χ	X		X	SI		Pose2d_New_TRRO.vi	pose2d new(translation2d, rotation2d)				
	Χ	X		X	SI		Pose2d_New.vi	pose2d new(double x, double y, rotation2d)				

	0 111101	polate	able r	Outill								
		X		Χ			Pose2d_Plus.vi	pose2d plus(transform2d other)				
	X	Χ		Χ	SI		Pose2d_RelativeTo.vi	pose2d relativeto(pose2d other)				
	X	X		Χ	SI		Pose2d_TransformBy.vi	pose2d transformby(transform2d other)				
							<u> </u>	pose2d new()	can use cluster constant			
ROTATION2D	X X X X X X X X X X X X X X 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	তি তি Execution Optimized তি তিয়া	Test Routine	VI Name Rotation2d_CreateAngle.vi Rotation2d_CreateAngleDegrees.vi Rotation2d_CreateAngleRotations.vi Rotation2d_CreateXY.vi Rotation2d_Equals.vi Rotation2d_Equals.vi Rotation2d_GetAngleCosSin.vi Rotation2d_GetCos.VI Rotation2d_GetDegrees.VI	Function Prototype rotation2d new(double value) rotation2d fromDegrees(double degrees) rotation2d new(double x, double y) boolean equals(rotation2d other) double getCos() double getDegrees()	Notes convert to radians then create New 1/26/21 use cluster unpack use cluster unpack, then convert to degree	Code Review	Test Program	Error Checking
	X	X			SI		Rotation2d_GetRadians.VI	double getRadians()	use cluster unpack			
	X	X		Χ	SI		Rotation2d_GetRotations.vi	1				
		Χ		X	SI		Rotation2d_GetSin.VI	double getSin()	use cluster unpack			
	X	Χ		Χ	SI		Rotation2d_GetTan.VI	double getTan()	can calculate			
	X	Χ		Χ	SI		Rotation2d_Interpolate.vi					
	X	Χ		Χ	SI		Rotation2d_Minus.vi	rotation2d minus(rotation2d other)				
	X	X		Χ	SI		Rotation2d_Plus.vi	rotation2d plus(rotation2d other)				
	X	Χ		Χ	SI		Rotation2d_RotateBy.vi	rotation2d rotateby(rotation2d other)				
	X	Χ		Χ	SI		Rotation2d Times.vi	rotation2d times(double scalar)				
	X	X		X	SI		Rotation2d_UnaryMinus.vi	rotation2d unaryminus()				
								rotation2d new()	can use cluster constant			
					Ø.							
TRANSFORM2D	X X X X X X X	X X X	X	X X X	SI SI SI SI SI SI SI	Test Routine	VI Name Transform2d Create PosePose.vi Transform2d Create TransRot.vi Transform2d Equals.VI Transform2d GetRotation.VI Transform2d GetTranslation.VI Transform2d GetXY.vi Transform2d GetXYAngle.vi Transform2d Inverse.vi Transform2d Plus.vi Transform2d Times.vi	Function Prototype transform2d new(pose2d, pose2d) transform2d new(translation2d, rotation2d) boolean equals(other transform2d) rotation2d getRotation() translation2d getTranslation() transform inverse() transform2d times(double scalar) transform2d new()	Notes use cluster unpack use cluster unpack new can use cluster constant	Code Review	Test Program	Error Checking

Part	Revision 2.X 5/2/2022 – added implicit model follower and tim	ne inter	polatable	e rout	nes.			_				
Marie		X	X	X	SI		Translation2d_GetY.VI	double getY()	can use cluster unpack			
Microstruction Micr		X	X	X	SI							
		X	X	$+$ \times	SI							
A				X	SI							
Part		X	X	X	SI							
Part		X	X	X	51							
Parents Pare		^	۸		31		Translationzu_onaryiviinus.vi		con uso cluster constant			
Particle Principle Princ												
TWISTO X X X S S Function Func								translationzd div(double scalar)	can multiply by 1/scalar			
Note	TWIST2	D X	X	X	SI	Test Routine	Twist2d_Create.vi	twist new(x, y, theta)	Notes	Code Review	Test Program	
CHASSIS PEEDS CHASSI		$\frac{1}{x}$	$\frac{\hat{x}}{x}$	$\frac{\lambda}{X}$	SI			Dooroun oqualo(obj other)				
CHASSIS SPEEDS	KINEMATICS				iized							
AX X X X S S ChassisSPeeds GetXYOmega.vi ChassisSpeeds new (double arguel) (an use cluster constant chassisspeeds new (double vel, double yel, double arguel) (an use cluster constant chassisspeeds new (double vel, double yel, double arguel) (an use cluster constant chassisspeeds new (double vel, double vel, double arguel) (an use cluster constant chassisspeeds new (double vel, double vel, double arguel) (an use cluster constant chassisspeeds new (double vel, double vel, double arguel) (an use cluster constant chassisspeeds new (double vel, double vel, double vel, double arguel) (an use cluster constant chassisspeeds new (double vel, double vel, d	CHARGE CREEN	<u> </u>				Test Routine		Function Prototype	Notes	Code Review	Test Program	
ChassisSpeeds New.vi chassisSpeeds new (double xvet, double xvet, double xvet, double angvet) chassisSpeeds new (double xvet, double xvet, double angvet) chassisSpeeds new (double xvet, double xvet, double xvet, double angvet) chassisSpeeds new (double xvet, double	CHASSIS SPEEDS	SX	X	X	SI		ChassisSpeeds_FromFieldRelativeSpeeds.VI	chassisspeeds fromFieldRelativeSpeeds(double x, double y,				
DIFFERENTIAL DRIVE KINEMATICS X X X X X X X X X X X X X X X X X X X		Y	X X	' Y	SI		Chassis SPeeds GetXYOmega vi	double angvei, rotation2d robotangle)	+			
DIFFERENTIAL DRIVE KINEMATICS X X X X X DIffKinematics, 10KheelSpeed vi chassisSpeeds (diffDriveWheelSpeeds (chassisSpeeds) DIFFERENTIAL DRIVE ODMETRY DIFFERENTIAL DRI								chassissneeds new (double yvel, double yvel, double angyel)				
DIFFERENTIAL DRIVE KINEMATICS X X X X X DIffKinematics, tokyheelSpeed vi A X X X X X X DIffKinematics, tokyheelSpeed vi A X X X X X X X X X X X X X X X X X X			<i>X</i>		O/		Onassisopecus_ivew.vi		can use cluster constant			
DIFFERENTIAL DRIVE ODOMETRY X DiffOdometry_Execute.vi Don't NEED	DIFFERENTIAL DRIVE KINEMATIC:	s X	X Docui	X Menu	X - Execution	X Test F	VI Name DiffKinematics_New.vi DiffKinematics_toChassisSpeed.vi	diffDriveKine new(double trackWidth) chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds)	Notes	_	<u> F</u>	Error Checking
	DIFFERENTIAL DRIVE ODOMETR'	YY	X	Men	Exec	Test Routine	DiffOdometry_Execute.vi	pose2d update(rotation2d gyro, double leftdist, double right dist diffDrOdom new(rotation gyro, pose initial) diffDrOdom new(rotation gyro)	DONT NEED) Incorporates enhanced reset	Code Review	Test Program	Error Checking
pose2d getPoseMeters()									incorporated into "update"			
								pose2d getPoseMeters()				

	======		
SPLIN	E		
'=====	======		

ibrary – vi implementation									_				
d implicit model follower and time	e intei	rpola	table	routin	es.								
CUBIC HERMITE SPLINE	X Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimize	Test Routine		VI Name . CubicHermiteSpline_getControlVectorFromArrays.vi	Function Prototype protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[]	Notes not needed, use cluster unpack	Code Review	Test Program	Error Checking
			-						initialVector, double[] finalVector)				
	X	X		X				CubicHermiteSpline_makeHermiteBasis.vi CubicHermiteSpline_New.vi	private SimpleMatrix makeHermiteBasis() public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector)				
POSE WITH CURVATURE	< Implemented	X Documented	Not WPILIB	X Menu Item	© Execution Optimized	Test Routine		VI Name PoseWithCurve New.vi	Function Prototype public PoseWithCurvature(Pose2d poseMeters, double	Notes	Code Review	Test Program	Error Checking
FOSE WITH CORVATORE	^	^		^	31			1 OSEVVILITO CITYE_INEW.VI	curvatureRadPerMeter)				
									public PoseWithCurvature()	can use cluster constant			
									public Pose2d poseMeters	not needed, use cluster unpack			
									public double curvatureRadPerMeter	not needed, use cluster unpack			
QUINTIC HERMITE SPLINE	X X Implemented	X X Documented	Not WPILIB	X X Menu Item	Execution Optim	Test Routine		VI Name QuinticHermiteSpline_getControlVectorFromArrays.vi QuinticHermiteSpline_makeHermiteBasis.vi QuinticHermiteSpline_New.vi	Function Prototype private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public QuinticHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector) protected SimpleMatrix getCoefficients()	Notes not needed, use cluster unpack	Code Review	Test Program	Error Checking
SPI INE /Abstract class)	< Implemented	< Documented	Not WPILIB	< Menu Item	Execution Optimized	Test Routine		VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
SPLINE (Abstract class)	X	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			
									public control vector (double[] x, double[] y)	implemented as data structure			
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
SPLINE HELPER		X	_ <	_ <u>≥</u> 	SI	7		VI Name SplineHelp_GetCubicCtrlVector.vi	private static Spline.ControlVector getCubicControlVector(double	NOTES	O		
SPLINE HELPER	^			_ ^	31			Opinion talp_GetCubicCttTvector.vt	private static Spline.Controlvector getCubicControlvector(double scalar, Pose2d point)				

me mie	i puia	lable	TOULIT	53.				
X	X		X	X	SplineHelp_GetCubicCtrlVectorsFromWayPts.vi	public static Spline.ControlVector[] getCubicControlVectorsFromWaypoints(Pose2d start, Translation2d∏ interiorWaypoints, Pose2d end)		
X	X	X	X		SplineHelp_GetCubicCtrlVectorsFromWeightedWayPts.vi	, , , , , , , , , , , , , , , , , , , ,		
X	X	X	No		SplineHelp_GetCubicSpline_Calc1.vi		internal	
X	X	X	No		SplineHelp_GetCubicSpline_Calc2.vi		internal	
X	X	X	No		SplineHelp_GetCubicSpline_Calc3.vi		internal	
X	X		X	X	SplineHelp_getCubicSplinesFromControlVectors.vi	public static CubicHermiteSpline[] getCubicSplinesFromControlVectors(Spline.ControlVector start, Translation2d[] waypoints, Spline.ControlVector end)		
X	X		X	SI	SplineHelp_GetQuinticCtrlVector.vi	private static Spline.ControlVector getQuinticControlVector(double scalar, Pose2d point)		
					SplineHelp_GetQuinticCtrlVectorsFromWayPts.vi	public static List <spline.controlvector> getQuinticControlVectorsFromWaypoints(List<pose2d> waypoints)</pose2d></spline.controlvector>	REMOVED 2762	
					SplineHelp_GetQuinticCtrlVectorsFromWeightedWayPts.vi	,,	REMOVED 2762	
X	X		X		SplineHelp_getQuinticSplinesFromControlVectors.vi	public static QuinticHermiteSpline[] getQuinticSplinesFromControlVectors(Spline.ControlVector[] controlVectors)		
X	X	X	X		SplineHelp_GetQuinticSplinesFromWeightedWayPts.vi		New 2762	
X	X		X		SplineHelp_GetQuinticSplinesFromWayPts.vi		New 2762	
X	X		No		SplineHelp_ThomasAlgorithm.vi	private static void thomasAlgorithm(double[] a, double[] b, double[] c, double[] d, double[] solutionVector)	internal	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	NI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
SPLINE PARAMETERIZER	X	X		X			SplineParam_Spline_T0_T1.vi	<pre>public static List<posewithcurvature> parameterize(Spline spline, double t0, double t1)</posewithcurvature></pre>				
	X	X		X		X	SplineParam_Spline.vi	public static List <posewithcurvature> parameterize(Spline spline)</posewithcurvature>				
	Χ	X	X	No			SplineParam_StackGet.vi		internal			
	X	X	X	No			SplineParam_StackPop.vi		internal			
	X	X	X	No			SplineParam_StackPush.vi		internal			

'======== TRAJECTORY '========

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
TRAJECTORY	Χ	Χ		X			Trajectory_Concatenate.vi					
	Χ	Χ		X			Trajectory_equals.vi	boolean equals(other obj)	FUTURE			
	Χ	Χ		X	SI		Trajectory_GetStates.vi	public List <state> getStates()</state>	not needed, use unpack			
	X	Χ		X	SI		Trajectory_GetTotalTime.vi	public double getTotalTimeSeconds()	not needed, use unpack			
	X	Χ		No	SI		Trajectory_lerp_double.vi	private static double lerp(double startValue, double endValue, double t)	internal			
	Χ	Χ		No	SI		Trajectory_lerp_Pose.vi	private static Pose2d lerp(Pose2d startValue, Pose2d endValue, double t)	internal			
	Χ	Χ		X	SI		Trajectory_New_Empty.vi					
	Χ	Χ		X	SI		Trajectory_New.vi	public Trajectory(final List <state> states)</state>				
	Χ	Χ		X			Trajectory_RelativeTo.vi	public Trajectory relativeTo(Pose2d pose)				
	X	Χ		X			Trajectory_Sample.vi	public State sample(double timeSeconds)				
	Χ	Χ	X	X			Trajectory_SampleReverse.vi		Sample in reverse order. Negate sample.			
	Χ	Χ		X			Trajectory_TransformBy.vi	public Trajectory transformBy(Transform2d transform)				
								public Pose2d getInitialPose()	can use cluster unpack, array index			

TrajectoryGenerate Make Generic.vi

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

List<Translation2d> interiorWaypoints, Pose2d end,

Use this one!!!

TrajectoryConfig config)

Helper to bring these all together

FRC LabVIEW Trajectory Library – VI Implementation I	List											
Revision 2.X 5/2/2022 – added implicit model follower and time	e inter			utines X			Traington/Congrete Make Quintie Ctrl\/eet.vi	public static Traingtony generate Traingtony/ Control\/catarlist	uaca quintia anlinea			
	^	^		^			TrajectoryGenerate_Make_Quintic_CtrlVect.vi	public static Trajectory generateTrajectory(ControlVectorList controlVectors, TrajectoryConfig config)	uses quintic splines			
	X	X .	Χ .	X			TrajectoryGenerate_Make_Quintic_Weighted.vi		New 2762			
	X	X		X			TrajectoryGenerate_Make_Quintic.vi	<pre>public static Trajectory generateTrajectory(List<pose2d> waypoints, TrajectoryConfig config)</pose2d></pre>	uses quintic splines			
	X	Х		X			TrajectoryGenerate_splinePointsFromSplines.vi	public static List <posewithcurvature> splinePointsFromSplines(Spline[] splines)</posewithcurvature>				
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
TRAJECTORY GENERATE (Control Vector)								public ControlVectorList(int initialCapacity)	may not need, just data			
								public ControlVectorList() public ControlVectorList(Collection extends Spline.ControlVector collection)	may not need, just data may not need, just data			
	Implemented	Doc			Execution Optimized Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
TRAJECTORY PARAMETERIZE	X			No			TrajectoryParam_calcStuffFwd.vi					
	X		X				TrajectoryParam_calcStuffRev.vi					
	X		X /	No No			TrajectoryParam_enforceAccel.vi TrajectoryParam_enforceVelocity.vi	private static void enforceAccelerationLimits(boolean reverse, List <trajectoryconstraint> constraints, ConstrainedState state)</trajectoryconstraint>	This routines needs to be changed when new constraints are added. This routines needs to be changed when new constraints are added.			
	X	X		X			TrajectoryParam_timeParam.vi	public static Trajectory timeParameterizeTrajectory(List <posewithcurvature> points. List<trajectoryconstraint> constraints, double startVelocityMetersPerSecond, double endVelocityMetersPerSecond, double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq, boolean reversed)</trajectoryconstraint></posewithcurvature>				
	Implemented	Doc	Not 1	Menu Item	Execution Optimized Test Routine	Sample Program		Function Prototype	Notes	Code Review	Test Program	Error Checking
TRAJECTORY PARAMETERIZE CONSTRAINED STATE		X		X			ConstrainedState_New.vi	ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double maxAccelerationMetersPerSecondSq)				
	X	Χ .	$\frac{x}{x}$	X		-	ConstrainedState_SetMaxAccel.vi					
		Χ.				+	ConstrainedState_SetMinAccel.vi					
		X .	X .	X		+	ConstrainedState_SetVelAccel.vi ConstrainedState_SetVelocity.vi					
	^	^ .		^			Constrained State_Servelocity.vi	ConstrainedState()				
	Implemented	Documented	t WPILIB	Menu Item	Execution Optimized Test Routine	mple Program				de Review	st Program	or Checking
			Not:	Σ l	Exec	Saı		Function Prototype	Notes	Code	7e.	Error
TRAJECTORY UTIL	Χ	X		X			TrajectoryUtil_fromPathWeaverJSON.vi	public static Trajectory fromPathweaverJson(Path path)				
	X	X .	X	X	X		TrajectoryUtil_MakeWeightedWayPoint_ENG.vi					

2/2022 – added implicit model follower and tir			X		X		TrajectoryUtil_MakeWeightedWayPoint.vi		
		X		X					
							TrajectoryUtil_toPathWeaverJSON.vi	public static void toPathweaverJson(Trajectory trajectory, Path	
								path)	
								public static Trajectory deserializeTrajectory(String json) public static String serializeTrajectory(Trajectory trajectory)	
								public static String senalize frajectory (frajectory trajectory)	
TRAPEZOID PROFIL	X X X X X X X	X X X X X X X		X	© Execution Optimic Test Routine		VI Name TrapProfConstraint_New.vi TrapProfile_Calculate.vi TrapProfile_Direct.vi TrapProfile_Execute.vi TrapProfile_Execute_AtGoal.vi TrapProfile_IsFinished.vi TrapProfile_New_DefInitial.vi TrapProfile_New.vi TrapProfile_ShouldFlipAcceleration.vi TrapProfile_TimeLeftUntil.vi	Function Prototype	Notes Private, remove from menu Private, remove from menu
	X	X		X			TrapProfile TotalTime.vi		
	X	Χ		X			TrapProfState_Equals.vi		
	X	Χ		X			TrapProfState_New.vi		
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized Test Routine	Sample Program			
		9	_8_	₩.	He Ex	Sa	VI Name		Notes
NTRIPETAL ACCELERATION CONSTRAIN	т х	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 now
	Implemented	Documented	Not WPILIB		Execution Optimized Test Routine		VI Name		Notes
DIFF DRIVE KINEMATIC CONSTRAIN	T X	X	_	X			DiffDriveKinematicsConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d	
	Y	У		Y			DiffDriveKinematicsConstraint_getMinMayAccel vi	velocityMetersPerSecond)	
	^	^		^			Dinantivoranomanosoonshanni_genviiniviaxAccei.vi	getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters,	
DIFF DRIVE KINEMATIC CONSTRAIN	т <i>х</i>			X			DiffDriveKinematicsConstraint_getMaxVelocity.vi DiffDriveKinematicsConstraint_getMinMaxAccel.vi	poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax	
	1 1		1		1	1	I .	ICOUNTRIVIANT CONTRACTOR MATERIAL CONTRACTOR AND CONTRACTOR CONTRA	
DIFF DRIVE KINEMATIC CONSTRAIN	TX	Χ	Not V	X	Exec Test.		DiffDriveKinematicsConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax	Notes

DiffDriveKinematicsConstraint_New.vi

Χ X X SI

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public DifferentialDriveKinematicsConstraint(final DifferentialDriveKinematics kinematics, double maxSpeedMetersPerSecond)

TRAJECTORY CONSTRAINT

Interface class - nothing done (not needed)

FRC LabVIEW Trajectory Library – VI Implementation List
Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. Test Routine Function Prototype
Constraint_MinMax_New TRAJECTORY CONSTRAINT (Min Max) X X Constraint MinMax New.vi X SI Constraint_MinMax_NewMinMax.VI Constraint_MinMax_New

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UTILITY

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

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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program Name	Function Prototype	Notes
UTIL		Χ	X	X	SI		Util ApproxEqual.vi	· · · · · · · · · · · · · · · · · · ·	
	Χ	X	X	X			Util_Array_PoseWCurv_to_XY.vi		
	Χ	Χ	Χ	X	SI		Util_CalcDist.vi		
	Χ	Χ	X	X	SI		Util_GetLibraryVersion.vi		
	Χ	Χ	Χ	Χ	SI		Util_GetLibUsage.vi		
	X	Χ	X	X			Util_GetTime.vi		Once tested completely, this should be optimized!
	Χ	Χ			N/A		Util_LibraryGlobals.vi		Global Variables – no block diag.
	Χ	Χ	Χ	X			Util_Trajectory_Absolute_To_Relative.vi		
	Χ	Χ	Χ	Χ			Util_Trajectory_ReadFile.vi		
	Χ	Χ	Χ	Χ			Util_Trajectory_to_XY.vi		
	Χ	Χ	Χ				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	X				Util_Trajectory_WriteFile_PathFinderConfig.vi		internal
	Χ	Χ	Χ	X			Util_Trajectory_WriteFile_Pathweaver.vi		
	Χ	Χ	X	No			Util_Trajectory_WriteFile_States.vi		internal
	Χ	Χ	Χ				Util_Trajectory_WriteFile_WayPoints.vi		internal
	X	Χ	X	X			Util_Trajectory_WriteFile.vi		
	Χ	Χ	X	X			Util_TrajectoryState_Meters_To_Inches.vi		
	Χ	Χ	X	X			Util_TrajState_to_DiffDrive_WheelPos.vi		
_	Χ	X	X	X			Util_DispWaypoint_Eng_To_SI.vi		
-	X	X	X	X			Util_DispWaypoint_To_CubicInput.vi		
-	X	X	X	X			Util_DispWaypoint_To_QuinticInput.vi		
-	X	X	X	X			Util_DispWeightedWaypiont_Eng_To_WeightedWaypoint		
	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 JAVA / C++ WPILIB EQUIVALENT

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes
CONV	X	Χ	X	X	SI		Conv_AngleDegrees_Heading.vi		
	Χ	Χ	Χ	X	SI		Conv_AngleRadians_Heading.vi		
	Χ	Χ	Χ	X	SI		Conv_Centimeters_Meters.vi		

ne inte	rpolat	able ı	routin	es.	
X	X	X	X	SI	Conv_Deg_Radians.vi
X	Χ	X	X	SI	Conv_Deg_Rotations.vi
X	Χ	X	X	SI	Conv_Feet_Meters.vi
X	Χ	Χ	Χ	SI	Conv_GyroDegrees_Heading.vi
X	Χ	Χ	Χ	SI	Conv_Heading_AngleRadians.vi
X	Χ	X	X	SI	Conv_Inches_Meters.vi
X	Χ	X	X	SI	Conv_Kilograms_Pounds.vi
X	Χ	X	X	SI	Conv_Meters_Feet.vi
X	Χ	Χ	Χ	SI	Conv_Meters_Inches.vi
X	X	X	X	SI	Conv_Pose2d_SI_Eng.vi
X	Χ	X	X	SI	Conv_Pounds_Kilograms.vi
X	Χ	X	X	SI	Conv_Radians_Deg.vi
X	Χ	X	X	SI	Conv_Radians_Rotations.vi
X	Χ	Χ	Χ	SI	Conv_Rotations_Deg.vi
Χ	Χ	X	Χ	SI	Conv_Rotations_Radians.vi
X	X	X	X	SI	Conv_Yards_Meters.vi

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

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PATHFINDER UTIL

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

	Implemented	Documented	× Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	\
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VI Name Function Prototype Notes
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 PathfinderUtil_Continuous_Heading_Difference.vi
PathfinderUtil_OptimizeTrajectoryStates.vi PathfinderUtil_ToTrajectory.vi
PathfinderUtil_ToTrajectoryStates.vi

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STATE SPACE MODEL

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FRC LabVIEW Trajectory Library – VI Implementation	List											
Revision 2.X 5/2/2022 – added implicit model follower and tim	e inte	erpolata	able rou	utines	3.							
					zed							
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimi Test Routine	Sample Program				de Review	st Program	or Checking
				β ı			VI Name	Function Prototype	Notes	ပိ	7e	Error
DC MOTOR	X	X		$X \mid 3$	SI		DCMotor_GetAndymark9015.vi					
	X	Χ		X .	SI		DCMotor_GetAndymarkRs775_125.vi					
	X	X		X	SI		DCMotor_GetBag.vi					
	X	X		X .	SI		DCMotor_GetBanebotsRs550.vi					
	X	X		X	SI		DCMotor_GetBanebotsRs775.vi					
	X	X		X	SI		DCMotor_GetCIM.vi					
		X		X	SI		DCMotor_GetCurrent.vi					
	X	X		X	SI		DCMotor_GetFalcon500.vi					
	X	X		X .	SI		DCMotor_GetMiniCIM.vi					
	X	X		X .	SI		DCMotor_GetNEO.vi					
	X	X		X .	SI		DCMotor_GetNEO550.vi					
	X	X		Χ .	SI		DCMotor_GetRomiBuiltIn.vi					
		X		X .	SI		DCMotor_GetVex775Pro.vi					
	X	X		X .	SI		DCMotor_New.vi					
	X	X		X .	SI		DCMotor_PickMotor.vi					
	Implemented	Documented			Execution Optimized Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
LINEAR SYSTEM ID				X			LinearSystemId_CreateDCMotorSystem.vi					
	X	X		X			LinearSystemId_CreateDriveTrainVelocitySystem.vi		Update to use create matrix			
		X		X			LinearSystemId_CreateElevatorSystem.vi		Update to use create matrix			
	X	X		X			LinearSystemId_CreateFlywheelSystem.vi		Update to use create matrix			
	X			X			LinearSystemId_CreateSingleJointedArmSystem.vi		Update to use create matrix			
	X	Χ		X			LinearSystemId_IdentifyDriveTrainSystem.vi		Update to use create matrix			
		X		X			LinearSystemId_IdentifyPositionSystem.vi		Update to use create matrix			
	X	X		X			LinearSystemId_IdentifyVelocitySystem.vi		Update to use create matrix			

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

> Test Routine Not WPILIB Notes Function Prototype DIFFERENTIAL DRIVE POSE ESTIMATOR X X DiffDrivePoseEst_AddVisionMeasurement.vi Χ DiffDrivePoseEst_FillStateVector.vi Χ X X X X X X X X DiffDrivePoseEst_GetEstimatedPosition.vi Χ Χ DiffDrivePoseEst_Kalman_F_Callback.vi X DiffDrivePoseEst_Kalman_H_Callback.vi Χ DiffDrivePoseEst_New.vi X X X X X X X X Χ DiffDrivePoseEst_ResetPosition.vi Χ DiffDrivePoseEst_SetVisionMeasurementStdDevs.vi X DiffDrivePoseEst_Update.vi DiffDrivePoseEst_UpdateWithTime.vi XX X DiffDrivePoseEst_VisionCorrect_Callback.vi X X X DiffDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi

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X 5/2/2022 – added implicit model follower and time	e interpo	olatabl	e routin	nes.								
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EXTENDED KALMAN FILTER			\overline{X}				ExtendedKalmanFilter Correct OnlyUY.vi	7				
	XX		X				ExtendedKalmanFilter Correct.vi		Just a shell, not functional!			
	XX	`	X				ExtendedKalmanFilter_GetP_Single.vi		Cust a silon, flot falloasilar.			
	XX	<u>, </u>	X				ExtendedKalmanFilter GetP.vi					
	XX	<u>`</u>	$\frac{\lambda}{X}$				ExtendedKalmanFilter_GetXHat_Single.vi					
	XX	/	X				ExtendedKalmanFilter GetXHat.vi			 '		
	XX	_	X				ExtendedKalmanFilter New.vi			 		
	<i>X X</i>		X									
	X /	<u> </u>					ExtendedKalmanFilter_Predict.vi			 		
	XX	Υ	X				ExtendedKalmanFilter_Reset.vi			 		
	XX		X				ExtendedKalmanFilter_SetP.vi			 '		
	XX		X				ExtendedKalmanFilter_SetXHat_Single.vi			<u> </u>		
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KALMAN FILTER			X		X		KalmanFilter_Correct.vi					
	XX	<	X				KalmanFilter_GetK			'		
	XX		X				KalmanFilter_GetK_Single.vi			1 '		
	XX	<	X				KalmanFilter_GetXHat					
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	XX	<	X		X		KalmanFilter New.vi					
	XX	· ·	X		X		KalmanFilter_Predict.vi					
	XX	· ·	X		- '		KalmanFilter Reset.vi					
	XX		$\frac{\lambda}{X}$				KalmanFilter SetXHat					
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KALMAN FILTER LATENCY COMPENSATOR			X				KalmanFilterLatencyComp_AddObserverState.vi			 '		
	XX	<	X				KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi			1 '		
	\ \ \ \ \ \		- 1				K F''	,		 		
	X X	Κ	X				KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v	1		1 '		
	XX	_	X				KalmanFilterLatencyComp_FindClosestMeasurement.vi			 '		
	<i>X X</i>	`	X				KalmanFilterLatencyComp_New.vi			 '		
	\ \ \ \ \ \	<u> </u>					KalmanFillerLatencyComp_New.vi			 '		
	XX	<u> </u>	X				KalmanFllterLatencyComp_Observer_New.vi			 		
	XX	Κ	X				KalmanFilterLatencyComp_Reset.vi			<u> </u>		
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022 – added implicit model follower and time	pulai	abic	Outill	CO
SWERVE DRIVE POSE ESTIMATOR				

)R				SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi	
λ	X	X		SwerveDrivePoseEst_AddVisionMeasurement.vi	
λ	<i>X</i>	X		SwerveDrivePoseEst_GetEstimatedPosition.vi	
λ	X	X		SwerveDrivePoseEst_Kalman_F_Callback.vi	
λ	X	X		SwerveDrivePoseEst_Kalman_H_Callback.vi	
λ	X	X		SwerveDrivePoseEst_New.vi	
λ	X	X		SwerveDrivePoseEst_ResetPosition.vi	
λ	X	X		SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi	
λ	X	X		SwerveDrivePoseEst_Update.vi	
λ	X	X		SwerveDrivePoseEst_UpdateWithTime.vi	
λ	X	X		SwerveDrivePoseEst_VisionCorrect_Callback.vi	
λ	X	X		SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	/I Name Function Prototype	Notes	Code Review	Test Program	Error Checking
UNSCENTED KALMAN FILTER	X			Χ				InscentedKalmanFilter_Correct_FuncGroup.vi				
	X	X		X				InscentedKalmanFilter_Correct_OnlyUY.vi				
	X	X		X				InscentedKalmanFilter_Correct_OnlyUYR.vi				
	Χ	X		X				InscentedKalmanFilter_Correct.vi				
	X			X				InscentedKalmanFilter_GetP_Single.vi				
	X			X				InscentedKalmanFilter_GetP.vi				
	X	X		X				InscentedKalmanFilter_GetXHat_Single.vi				
	X	X		X				InscentedKalmanFilter_GetXHat.vi				
	X	Χ		X				InscentedKalmanFilter_New_Default.vi				
	Χ			Χ				InscentedKalmanFilter_New_FuncGroup.vi				
	Χ	X		X				JnscentedKalmanFilter_New.vi				
	Χ	Χ		X				InscentedKalmanFilter_Predict.vi				
	Χ	Χ		Χ				JnscentedKalmanFilter_Reset.vi				
	X	X		Χ				JnscentedKalmanFilter_SetP.vi				
	X	X		X				JnscentedKalmanFilter_SetXHat_Single.vi				
	X	X		X				UnscentedKalmanFilter_SetXHat.vi				
	X	X		X				InscentedKalmanFilter_Transform.vi				

'======== STATE SPACE CONTROL

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Function Prototype Notes CONTROL AFFINE PLANT INVERSION FEEDFORWARD Notes Function Prototype DIFFERENTIAL DRIVE ACCELERATION LIMITER X DiffDrvAccelLimit_Calculate.vi X X DiffDrvAccelLimit_New.vi

2.X 5/2/2022 – added implicit model follower and time	List ne inter	polata	able r	outines	÷					
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IMPLICIT MODEL FOLLOWER	₹ X			X	X		ImplModelFollow_Calculate.vi			
	Χ			X	X		ImplModelFollow_GetU.vi			\perp
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LINEAR PLANT INVERSION FEEDFORWARD				X			LinearPIntInvFF_Calculate_NextR.vi			+
'	X	X		X	_		LinearPlntInvFF_Calculate.vi			+
'	X	-		X X			LinearPIntInvFF_GetR_Single.vi LinearPIntInvFF_GetR.vi			+
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	X	$\frac{\lambda}{X}$		X			LinearPIntInvFF GetUff.vi		+	+
'	X	$\frac{x}{x}$		X			LinearPIntInvFF New Plant.vi			+
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	X	Χ		X			LinearPIntInvFF_Reset_Initial.vi			
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LINEAR QUADRATIC REGULATOR	8 X X X X	X X X X	Not	X Wenu Item	ution Routi	Samp	LinearQuadraticRegulator_Calculate_NextR.vi LinearQuadraticRegulator_Calculate.vi LinearQuadraticRegulator_GetK_Single.vi LinearQuadraticRegulator_GetK.vi	Code Review	ą.	_ _ _ _
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Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. LTVDiffDriveCtrl Calculate SetTolerance.vi Χ Χ LTVDiffDriveCtrl Calculate AtReference.vi Execution Opt Test Routine Vot WPILIB VI Name Function Prototype Notes LTV UNICYCLE CONTROLLER Χ X LTVUnicycleCtrl AtReference.vi X LTVUnicycleCtrl Calculate Orig.vi Χ X This one computes a new LQR each time. Χ LTVUnicycleCtrl_Calculate_TrajState_Orig.vi This one computes a new LQR XX each time. Χ LTVUnicycleCtrl_Calculate_TrajState.vi Χ X Χ Χ Χ LTVUnicycleCtrl_Calculate.vi Χ X X LTVUnicycleCtrl_New.vi Χ Χ X LTVUnicycleCtrl_SetEnabled.vi Χ Χ X LTVUnicycleCtrl_SetTolerance.vi '======== STATE SPACE UTILITIES '======== **Test Routine** Vot WPILIB Function Prototype Notes CALLBACK HELPER X X CallbackHelp MatrixMinus.vi $X \mid X$ XX CallbackHelp MatrixMult CoerceSizeB.vi $X \mid X \mid$ X X X X CallbackHelp_MatrixMult.vi X X X X CallbackHelp_MatrixPlus.vi Test Routine Function Prototype Notes DISCRETIZATION X X Discretization DiscretizeA.vi X XX Χ Χ Discretization DiscretizeAB.vi Discretization_DiscretizeABTaylor.vi XX X Χ XX Discretization DiscretizeAQ.vi X X Discretization DiscretizeAQTaylor.vi $X \mid X$ X X Discretization DiscretizeR.vi $X \mid X$ X Routine Documented Not WPILIB Function Prototype Notes STATE SPACE UTIL X X X No StateSpaceUtil Check Stabalizable.vi Internal routine XX Χ StateSpaceUtil ClampInputMaxMagnitude.vi Routine exists, it is just a shell XX X StateSpaceUtil IsDetectable.vi

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X X DiffDriveTrainSim_GetRightVelocityMetersPerSecond vi	DIFFERENTIAL DRIVE TRAIN S	SIM	X X X X X X X X X X X X X X X X X X X	Execution Optimized	DiffDriveTrainSim_ClampInput.vi DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi DiffDriveTrainSim_CreateKitbotSim.vi DiffDriveTrainSim_GetCurrentDrawAmps.vi DiffDriveTrainSim_GetCurrentGearing.vi DiffDriveTrainSim_GetDynamics.vi DiffDriveTrainSim_GetHeading.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftPositionMeters.vi DiffDriveTrainSim_GetLeftVelocityMetersPerSecond DiffDriveTrainSim_GetOutput_Single.vi DiffDriveTrainSim_GetPose.vi	i	Notes	Code Review	Test Program
	DIFFERENTIAL DRIVE TRAIN S	SIM	X X X X X X X X X X X X X X X X X X X	Execution Optimized	DiffDriveTrainSim_ClampInput.vi DiffDriveTrainSim_CreateKitbotSim_EstMass.vi DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi DiffDriveTrainSim_CreateKitbotSim.vi DiffDriveTrainSim_GetCurrentDrawAmps.vi DiffDriveTrainSim_GetCurrentGearing.vi DiffDriveTrainSim_GetDynamics.vi DiffDriveTrainSim_GetHeading.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi DiffDriveTrainSim_GetLeftVelocityMetersPerSecond DiffDriveTrainSim_GetOutput_Single.vi DiffDriveTrainSim_GetPose.vi DiffDriveTrainSim_GetPose.vi	i	Notes	Code Review	Test Program

DiffDriveTrainSim_GetState_Single.vi
DiffDriveTrainSim_GetState.vi

	X	X	X			DiffDriveTrainSim_GetState.vi				
	X .	X	X			DiffDriveTrainSim_KitBotWheelSize.vi				
		X	X			DiffDriveTrainSim New Mass MOI.vi				
	X	X	X			DiffDriveTrainSim New.vi				
		X	X			DiffDriveTrainSim SetCurrentGearing.vi				
		x	$\frac{1}{X}$			DiffDriveTrainSim SetInputs.vi				
			\ \ \ \ \							
	X .	X	X			DiffDriveTrainSim_SetPose.vi				
		X	X			DiffDriveTrainSim_SetState.vi				
	X .	X	X			DiffDriveTrainSim_ToughBoxMiniGearRatio.vi				
	X .	X	X			DiffDriveTrainSim_ToughBoxMiniMotor.vi				
	X	X	X			DiffDriveTrainSim_Update.vi				
ELEVATOR SIM	X X	X X X X X X X X X X X X X X X X X X X	X X X X X X		Test Routine	VI Name ElevatorSim_GetCurrentDraw.vi ElevatorSim_GetPositionMeters.vi ElevatorSim_GetVelocityMetersPerSecond.vi ElevatorSim_HasHitLowerLimit.vi ElevatorSim_HasHitUpperLimit.vi ElevatorSim_New_LinSys_NoNoise.vi ElevatorSim_New_LinSys.vi ElevatorSim_New_NoNoise.vi ElevatorSim_New_NoNoise.vi ElevatorSim_New_NoNoise.vi	Notes	Code Review	Test Program	Error Checking
	X	X	X			ElevatorSim_SetInputVoltage.vi				
			X			ElevatorSim SetState.vi				
	X .	X	/ X				N 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			
	X	X >	(X			ElevatorSim_Update.vi	Needed because this doesn't			
							extend.			
	X .	X	X			ElevatorSim_UpdateX.vi				
	X	X	X			ElevatorSim_WouldHitLowerLimit.vi				
	X .	X	X			ElevatorSim_WouldHitUpperLimit.vi				
FLYWHEEL SIM	X X X X X X	X X Documented	X X X X X X X X X X X X X X X X X X X	Exec	Test Routine	VI Name FlyWheelSim_GetAngularVelocityRadPerSec.vi FlyWheelSim_GetAngularVelocityRPM.vi FlyWheelSim_GetCurrentDrawAmps FlyWheelSim_New_LinSys FlyWheelSim_New_LinSys_MOI_NoNoise FlyWheelSim_New_LinSys_NoNoise FlyWheelSim_New_MOI.vi FlyWheelSim_New_MOI.vi FlyWheelSim_SetInput.vi FlyWheelSim_SetState.vi FlyWheelSim_Update.vi	Notes Future Future Future	Code Review	Test Program	Error Checking
	Implemented	Documented	Menu Item	Execution Optimized	Test Routine	VI Name Function Prototype	Notes	Code Review	Test Program	Error Checking

FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time into LINEAR SYSTEM SIM X

d time	inter	rpolatat	ble routin	ies.		
ISIM	Χ	X	X		LinearSystemSim_ClampInput.vi	
					LinearSystemSim_GetCurrentDrawAmps.vi	DONT IMPLEMENT
	Χ	X	X		LinearSystemSim_GetOutput_Single.vi	
	Χ	X	X		LinearSystemSim_GetOutput.vi	
	Χ	X	X		LinearSystemSim_New	
					LinearSystemSim_New_NoNoise.vi	
	Χ	X	X		LinearSystemSim_SetInput_Array.vi	Doesn't use clamp ?
	Χ	X	X		LinearSystemSim_SetInput_Single.vi	
	Χ	X	X		LinearSystemSim_SetInput.vi	
	Χ	X	X		LinearSystemSim_Setstate.vi	
	Χ	X	X		LinearSystemSim_Update.vi	
	Χ	X	No		LinearSystemSim_UpdateX.vi	
	X	X .	X No		LinearSystemSim_UpdateY.vi	

	Implemented	Documented	Not WPILIB	Menu	Execution Optimized Test Routine	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
SINGLE JOINT ARM SIM		X		X		SngJntArmSim_EsitmateMOI.vi					
		X		X		SngJntArmSim_GetAngleRads.vi					
	$\overline{}$	X		X		SngJntArmSim_GetCurrentDraw.vi					
		X		X		SngJntArmSim_GetVelocityRadsPerSec.vi					
		X	;	X		SngJntArmSim_HasHitLowerLimit.vi					
		X	;	X		SngJntArmSim_HasHitUpperLimit.vi					
		X		X		SngJntArmSim_New.vi					
		X	٨	lo 📗		SngJntArmSim_Rkf45_Func.vi					
	X	X		X		SngJntArmSim_SetInputVoltage.vi					
		X	;	X		SngJntArmSim_SetState.vi					
		X		X		SngJntArmSim_Update.vi					
		X		X		SngJntArmSim_UpdateX.vi					
		X		X		SngJntArmSim_WouldHitLowerLimit.vi					
	Χ	X		X		SngJntArmSim_WouldHitUpperLimit.vi					

'======== MATRIX UTILITIES '========

> VI Name Function Prototype Notes MAT BUILDER X X X X X X X SI X SI MatBuilder_Create.vi MatBuilder_Fill.vi

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATRIX	X	X		X	SI			Matrix_AssignBlock.vi					
	X	X		X	SI			Matrix_Block.vi					
								Matrix_ChangeBoundsUnchecked.vi					
	Χ	X		X	SI			Matrix_Create.vi					
								Matrix_Det.vi					
	X	X		X	SI			Matrix_Diag.vi					

nodel follower and time		nolata	ble r	outine	s						
	, iiiici	polate		Juline	J.		Matrix_Div_Scalar.vi	labview has function			
							Matrix ElementPower.vi	las view rias ransasir			
	X	X		X	SI		Matrix ElementSum.vi				
					·		Matrix ElementTimes.vi				
							Matrix_Equals.vi				
	Χ	X		X	1		Matrix_Exp.vi				
	Χ	X		X	SI		Matrix ExtractColumnVector.vi				
	Χ	X		X	SI		Matrix_ExtractFrom.vi				
							Matrix_ExtractMatrix.vi				
	X			Χ			Matrix_ExtractRowVector.vi				
	Χ	X		Χ	SI		Matrix_Fill.vi				
							Matrix_Get.vi	labview has function			
	Χ	X		Χ	1		Matrix_Ident.vi	WPILIB calls this EYE			
							Matrix_Inv.vi				
	Χ	X	-	X	SI		Matrix_IsEqual.vi				
							Matrix_IsIdentical.vi				
	X	<u> </u>		X			Matrix_LLTDecompose.vi				
							Matrix_Max.vi Matrix_MaxAbs.vi				
							Matrix_MaxAbs.vi Matrix_Mean.vi				
							Matrix MinInternal.vi				
			\rightarrow			_	Matrix Minus Matrix.vi				
							Matrix_Minus_Scalar.vi				
	X	X		X	1		Matrix_NormF.vi				
							Matrix NormIndP1.vi				
							Matrix Plus Matrix.vi				
							Matrix_Plus_Scalar.vi				
	Χ	X		Χ			Matrix_Pow.vi	THIS NEEDS WORK!!!!			
	Χ	Χ			SI		Matrix_SetColumn.vi				
	X	X		X	SI		Matrix_SetRow.vi THERE ARE LOTS OF OTHER MATRIX FUNCTIONS THAT				
							SHOULD BE INCLUDED HERE FOR ISOLATION.				
			_				Matrix_Solve.vi				
			-			-	Matrix_Times_Matrix.vi				
							Matrix_Times_Scalar.vi Matrix_Trace.vi				
	X	X	-	X	SI		Matrix_Transpose.vi				
	X			X	Si.		Matrix WithinTolerance.vi				
	^		^	^			Matrix_Vittili11 Olerance.vi				
	Implemented	Documen	Not WPILIB	Menu Iten	Execution Optimized	Test Routine	VI Name Function Prototype	Notes	Code Review	Test Program	Error Checking
SIMPLE MATRIX	X	X		X	SI		SimpleMatrix_ExtractMatrix.vi	NOTE Matrix also has an ExtractMatrix with different calling			
								parameters YUK.			
			\neg					parameteren i erti			
ı											
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine			Code Review	Test Program	or Checking
	lmp	ροχ	Not	Me	Εχε	Tes	VI Name Function Prototype	Notes	ŏ	Tes	Error
MATRIX HELPER		\overline{X}	\overline{X}		SI	·-	MatrixHelper_CooerceSize.vi			1-	,
	Χ	X	X	X	SI		MatrixHelper_MultCooerceBSize.vi				
	Χ	X	Χ	X	SI		MatrixHelper_Zero.vi				

model follower and time		polat	WPILIB	outine routine	cution Optimized "	t Routine	nple Program			le Review	t Program	or Checking
	lmp	Рос	Not	Mer	Exe	Tes	VI Name	Function Prototype	Notes	Coo	Tes	Erro
VECTOR BUILDER	X	Χ		X	SI		VecBuilder_1x1Fill.vi					
	Χ	Χ		Χ	SI		VecBuilder_2x1Fill.vi					
	Χ	Χ		Χ	SI		VecBuilder_3x1Fill.vi					
	Χ	Χ		X	SI		VecBuilder_4x1Fill.vi					
	Χ	Χ			SI		VecBuilder_5x1Fill.vi					
	Χ	Χ		Χ	SI		VecBuilder 6x1Fill.vi					
	Χ	X			SI		VecBuilder 7x1Fill.vi					
	Χ	X		Χ	SI		VecBuilder_8x1Fill.vi					
							VecBuilder_9x1Fill.vi					
							VecBuilder_10x1Fill.vi					
	Χ	Χ	Χ	Χ	SI		VecBuilder_ArrayBy1Fill.vi					
							·		·			

				VecBuilder_9X1Fill.VI					
				VecBuilder_10x1Fill.vi					
X	XX	X SI		VecBuilder_ArrayBy1Fill.vi					
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Implemented	Documentea Not WPILIB	Menu Item Execution Op	Test Routine Sample Prog	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
ANGLE STATISTICS \overline{X}	\overline{X}	XX	· ,,	AngleStats_AngleAdd_CallbackHelp.vi	75-			·	
X X		XI	X	AngleStats_AngleAdd.vi					
Y	XX	XX	7	AngleStats_AngleMean_CallbackHelp.vi					
X	X	X X X	Y	AngleStats_AngleMean.vi			-		
X V	XX	XX	^	AngleStats_AngleResidual_CallbackHelp.vi					
<u> </u>	X	XI	V	AngleStats_AngleResidual.vi					
<u> </u>	X	X 1	X	AngleStats_AngleResidual.vi					
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nted	ted IB	n 1 Optin	tine rograi				/iew	ıram	cking
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emented	umented WPILIB	u Item cution Optin	: Routine iple Prograi				e Review	: Program	r Checking
nplemented	ocumented ot WPILIB	fenu Item xecution Optin	est Routine ample Prograi	MI Name	For the Destator	Nation	ode Review	est Program	rror Checking
Implemented	Documented Not WPILIB	Menu Item Execution Optin	Test Routine Sample Progran	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATH UTILITY X	X	X SI		MathUtil_AngleModulus.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
$\begin{array}{c} MATHUTILITY \\ \hline X \\ \end{array}$	X	X SI X SI		MathUtil_AngleModulus.vi MathUtil_ApplyDeadband.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATH UTILITY X X X	X X X	X SI X SI X SI		MathUtil_AngleModulus.vi MathUtil_ApplyDeadband.vi MathUtil_Clamp_Int.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATH UTILITY X X X X	X X X	X SI X SI X SI X SI		MathUtil_AngleModulus.vi MathUtil_ApplyDeadband.vi MathUtil_Clamp_Int.vi MathUtil_Clamp.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATH UTILITY X X X X X X	X X X X	X SI		MathUtil_AngleModulus.vi MathUtil_ApplyDeadband.vi MathUtil_Clamp_Int.vi MathUtil_Clamp.vi MathUtil_InputModulus.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATH UTILITY X X X X X X	X X X	X SI X SI X SI X SI		MathUtil_AngleModulus.vi MathUtil_ApplyDeadband.vi MathUtil_Clamp_Int.vi MathUtil_Clamp.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATH UTILITY X X X X X X	X X X X	X SI		MathUtil_AngleModulus.vi MathUtil_ApplyDeadband.vi MathUtil_Clamp_Int.vi MathUtil_Clamp.vi MathUtil_InputModulus.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATH UTILITY X X X X X X	X X X X	X SI		MathUtil_AngleModulus.vi MathUtil_ApplyDeadband.vi MathUtil_Clamp_Int.vi MathUtil_Clamp.vi MathUtil_InputModulus.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATH UTILITY X X X X X X	X X X X	X SI		MathUtil_AngleModulus.vi MathUtil_ApplyDeadband.vi MathUtil_Clamp_Int.vi MathUtil_Clamp.vi MathUtil_InputModulus.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATH UTILITY X X X X X X	X X X X	X SI X X SI X X SI X X X X X X X X X		MathUtil_AngleModulus.vi MathUtil_ApplyDeadband.vi MathUtil_Clamp_Int.vi MathUtil_Clamp.vi MathUtil_InputModulus.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATH UTILITY X X X X X X	X X X X	X SI X	ram	MathUtil_AngleModulus.vi MathUtil_ApplyDeadband.vi MathUtil_Clamp_Int.vi MathUtil_Clamp.vi MathUtil_InputModulus.vi	Function Prototype	Notes			
MATH UTILITY X X X X X X	X X X X X	X SI	ram	MathUtil_AngleModulus.vi MathUtil_ApplyDeadband.vi MathUtil_Clamp_Int.vi MathUtil_Clamp.vi MathUtil_InputModulus.vi	Function Prototype	Notes			
MATH UTILITY X X X X X X	X X X X X	X SI	ram	MathUtil_AngleModulus.vi MathUtil_ApplyDeadband.vi MathUtil_Clamp_Int.vi MathUtil_Clamp.vi MathUtil_InputModulus.vi	Function Prototype	Notes			
MATH UTILITY X X X X X X	X X X X X	X SI	ram	MathUtil_AngleModulus.vi MathUtil_ApplyDeadband.vi MathUtil_Clamp_Int.vi MathUtil_Clamp.vi MathUtil_InputModulus.vi	Function Prototype	Notes			
MATH UTILITY X X X X X X	X X X X X	X SI	st Routine mple Program	MathUtil_ApplyDeadband.vi MathUtil_Clamp_Int.vi MathUtil_Clamp.vi MathUtil_InputModulus.vi MathUtil_Interpolate.vi					
MATH UTILITY X X X X X X X	Documented X X X X X Not WPILIB	Menu Item X SI X	Test Routine Sample Program	MathUtil_ApplyDeadband.vi MathUtil_Clamp_Int.vi MathUtil_Clamp.vi MathUtil_InputModulus.vi MathUtil_Interpolate.vi	Function Prototype Function Prototype	Notes	Code Review	Test Program	Error Checking
MERWE SCALED SIGMA POINTS X	X Documented X X Not WPILIB	X Menu Item X SI X SI X SI X Si X Si Execution Optimized	Test Routine Sample Program	MathUtil_ApplyDeadband.vi MathUtil_Clamp_Int.vi MathUtil_Clamp.vi MathUtil_InputModulus.vi MathUtil_Interpolate.vi VI Name MerweScSigPts_ComputeWeights.vi					
MATH UTILITY X X X X X X X X X X X X X	X	X SI	Test Routine Sample Program	MathUtil_ApplyDeadband.vi MathUtil_Clamp_Int.vi MathUtil_Clamp_vi MathUtil_InputModulus.vi MathUtil_Interpolate.vi VI Name MerweScSigPts_ComputeWeights.vi MerweScSigPts_GetNumSigmas.vi					
MATH UTILITY X X X X X X X X X X X X X	Documented X X X X X Not WPILIB	Menu Item X SI X	Test Routine Sample Program	MathUtil_ApplyDeadband.vi MathUtil_Clamp_Int.vi MathUtil_Clamp.vi MathUtil_InputModulus.vi MathUtil_Interpolate.vi					

FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. XX X SI MerweScSigPts GetWc.vi XX X SI MerweScSigPts GetWm Single.vi XX X SI MerweScSigPts GetWm.vi XX ΧI MerweScSigPts_New_Default.vi XX XI MerweScSigPts_New.vi XX XI MerweScSigPts_SigmaPoints.vi Execution Optin Test Routine Vot WPILIB VI Name **Function Prototype** NUMERICAL INTEGRATION X NOT USED. Should this be used NumIntegrate Func Ax Bu K.vi or abandoned??? $X \mid X$ NumIntegrate Rk4 Dbl X U.vi X NumIntegrate Rk4 Dbl X.vi $X \mid X$ Χ NumIntegrate_Rk4_Mat_X_U.vi XX Χ XX NumIntegrate Rk4 Mat X.vi Χ NumIntegrate_Rkdp_Func_A.vi XX No SI XX No SI NumIntegrate_Rkdp_Func_B1.vi $X \mid X$ No SI NumIntegrate Rkdp Func B1B2.vi XX No SI NumIntegrate Rkdp Func B2.vi XX Numintegrate Rkdp Impl.vi No I XX NumIntegrate_RKDP_Mat_X_U.vi X New replacement for RKF45 No SI XX NumIntegrate_Rkf45_Func_A.vi XX No SI NumIntegrate Rkf45 Func B1.vi XX No SI NumIntegrate Rkf45 Func B1B2.vi $X \mid X$ No SI NumIntegrate Rkf45 Func B2.vi NumIntegrate_RKf45_Func_Bs.vi Removed. Replaced with newer functions. NumIntegrate RKf45 Func Ch.vi Removed. Replaced with newer functions. NumIntegrate RKf45 Func Ct.vi Removed. Replaced with newer functions. XX No I NumIntegrate_Rkf45_Impl.vi XX Χ NumIntegrate_Rkf45_Mat_X_U.vi Note that this Feinberg method has been changed and a Dormand Price method has been implemented.... TODO NumIntegrate RKf45 New.vi Removed. Never used. X X X X SI NumIntegrate Trap Dbl.vi $X \mid X \mid X \mid X \mid I$ NumIntegrate Trap Mat.vi Test Routine Not WPILIB VI Name Function Prototype Notes RUNGE KUTTA TIME VARYING XNo RungeKuttaTimeVarying RK4 Mat T Y.vi Test Routine Not WPILIB

VI Name

NumJacobian U.vi

NumJacobian X.vi

Function Prototype

Notes

NUMERICAL JACOBIAN X X

XX

Χ

FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. Test Routine Function Prototype VI Name Notes RICCATI X Riccati Check Detectable.vi Routine exists, it is just a shell Χ X Riccati_Check_Stabilizable.vi Not really done !!! Χ XX Χ Riccati DARE Iterate.vi X Χ X X X Riccati_DARE_StructDoubling.vi X Χ Riccati DARE N.vi $X \mid X$ X Riccati DARE.vi Riccati Input Check.vi Χ '----VISION '======== Test Routine Vot WPILIB *cecution* Function Prototype Notes COMPUTER VISION UTILITIES CompVisionUtil_CalculateDistanceToTarget.vi XX Χ CompVisionUtil_EstimateCameraToTarget.vi X XX Χ CompVisionUtil_EstimateFieldToCamera.vi XX X CompVisionUtil_EstimateFieldToRobot.vi XX X CompVisionUtil EstimateFieldToRobot Alt.vi '----TYPE DEFINITIONS '========= Test Routine Sode Review Not WPILIB Function Prototype Notes ARM FF.CTL TypeDef Z X X X N/A BANG_BANG.CTL $Z \mid X \mid X \mid X \mid N/A$ BICon-Matrix_FUNC_TYPE.CTL NOT USED. Should this be $X \mid X \mid N/A$ deleted or abandoned??? Z X X X N/A CALLBACK FUNC TYPE.CTL Z X X X N/A CHASSIS SPEEDS.CTL Z X X X N/A CONTRAINED STATE.CTL Z X X X N/A DCMOTOR TYPES ENUM.CTL Z X X X N/A DCMOTOR.CTL DCMOTOR SIM.CTL $Z \mid X \mid X \mid X \mid N/A$ DEBOUNCER TYPE ENUM.Ctl $Z \mid X \mid X \mid X \mid N/A$

Z X X X N/A

Z X X X N/A

Z X X X N/A

Z X X X N/A Z X X X N/A

Z X X X N/A

Z X X X N/A

Z X X X N/A

DEBOUNCER.CTL

DIFF DRIVE ACCEL LIMIT.CTL

DIFF_DRIVE_KINEMATICS.CTL

DiFF DRIVE Pose EST.ctl

DIFF_DRIVE_Kitbot_WheelSize_ENUM.ctl

DIFF_DRIVE_ToughBoxMini_GearChoice_ENUM.ctl

DIFF DRIVE TRAIN SIM STATE ENUM.CTL

DIFF_DRIVE_ToughBoxMini_MotorChoice_ENUM.ctl

time inter	rpolat	able				
Z	Χ	X	X	N/A	DIFF_DRIVE_TRAIN_SIM.ctl	
Z	X	X	X	NA	DISPLAY WAYPOINT.ctl	Was UTIL WAYPOINT.VI
Z	Χ	X		NA	DISPLAY_WEIGHTED_WAYPOINT.ctl	New V1.5. was
						UTIL_WEIGHTED_WAYPOINIT.VI
Z	Χ	X		N/A	ELEV_FF.CTL	
Z	Χ	X	X	N/A	ELEVATOR_SIM.CTL	
Z	Χ	X	X	N/A	EXTENDED KALMAN CORRECT FUNC GROUP.CTL	
Z		Χ		N/A	EXTENDED KALMAN FILTER.CTL	
Z	Χ	Χ		N/A	FLYWHEEL SIM.ctl	
Z	Χ	X		N/A	FUNCTION GENERATOR.ctl	
Z	X	X		N/A	FUNCTION GENERATOR MATRIX.ctl	
Z	X	X		N/A	HOLONOMIC DRV CTRL.CTL	New 1/26/21
Z	X	X		N/A	TIME INTERPOLATABLE BOOLEAN.CTL	170111111111111111111111111111111111111
Z	X	X		N/A	TIME INTERPOLATABLE DOUBLE.CTL	
Z	X	X		N/A	TIME INTERPOLATABLE POSE2D.CTL	
Z	X	X		N/A	TIME INTERPOLATABLE ROTATION2D.CTL	
	X	X		N/A	KALMAN FILTER LATENCY COMP FUNC GROUP.CTL	
Z					KALMAN FILTER LATENCY COMP.CTL KALMAN FILTER LATENCY COMP.CTL	
Z	X	X		N/A		
Z	X	X		N/A	KALMAN_FILTER.ctl	
Z	X	X		N/A	LINEAR_FILTER.CTL	
Z	X	X		N/A	LINEAR_PLANT_INV_FF.ctl	
Z	Χ	X		N/A	LINEAR_QUADRATIC_REGULATOR.ctl	
Z	Χ	X		N/A	LINEAR_SYSTEM_LOOP.ctl	
Z	Χ	X		N/A	LINEAR_SYSTEM_SIM.ctl	
Z	Χ	X		N/A	LINEAR_SYSTEM.ctl	
Z		Χ		N/A	LTV_DIFF_DRIVE_CTRL.ctl	
Z		Χ	X	N/A	LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl	
Z		Χ	X	N/A	LTV UNICYCLE CONTROLLER.CTL	
Z		Χ	X	N/A	LTV UNICYCLE CONTROLLER INPUT ENUM.ctl	
Z		Χ		N/A	LTV UNICYCLE CONTROLLER STATE ENUM.ctl	
Z	Χ	Χ		N/A	MECA DRIVE KINEMATICS.CTL	
Z	X	X		N/A	MECA DRIVE ODOMETRY.CTL	
Z	X	X		N/A	MECA WHEEL SPEEDS.CTL	
Z	X	X		N/A	MEDIAN FILTER.CTL	
Z	X	X		N/A	MERWE_SCALED_SIGMA_PTS.ctl	
Z	X	X		N/A	OBSERVER SNAP LIST ITEM.CTL	
Z	X	X		N/A	OBSERVER SNAPSHOT.CTL	
Z	X	X		N/A	PARAM STACK ITEM.CTL	
Z	X	\hat{X}		N/A	PARAM STACK.CTL	
	X	X		N/A	PID ADV LIMITS.CTL	
Z					PID ADV TUNING.CTL	
Z	X	X		N/A		
Z		X		N/A	PID_CONTROLLER.CTL	
Z	X	X		N/A	PID_ERROR_TOLERANCE.CTL	
Z	Χ	X		N/A	PID_INPUT_LIMITS.CTL	
Z	Χ	X		N/A	PID_TUNING.CTL	
Z	Χ	X		N/A	POSE2D.CTL	
Z	Χ	X		N/A	POSEwCURVATURE.CTL	
Z	Χ	X		N/A	PROFILED_PID_CONTROLLER.CTL	
Z	Χ	X		N/A	RAMSETE_EXE_TUNING.CTL	
Z	Χ	X		N/A	RAMSETE.CTL	
Z	Χ	Χ		N/A	ROTATION2D.CTL	
Z	Χ	Χ		N/A	SIMPLE_MOTOR_FF.CTL	
Z	Χ	X	X	N/A	SINGLE_JOINT_ARM_SIM.CTL	
Z	Χ	Χ		N/A	SLEW_RATE_LIMITER.CTL	
Z	Χ	X		N/A	SPLINE CTRL VECTOR.CTL	
Z	X	X		N/A	SPLINE.CTL	
Z	X	X		N/A	SWERVE DRIVE KINEMATICS.CTL	
Z	X	X		N/A	SWERVE DRIVE MODULE STATE.CTL	
Z	X	X		N/A	SWERVE DRIVE ODOMETRY.CTL	
Z	X	X		N/A	SWERVE DRIVE Pose EST.CTL	
Z	X	X		N/A	TIMER.CTL	
Z	X	X		N/A	TRAJ CONFIG.CTL	
Z	X	X		N/A	TRAJ_CONFIG.CTL TRAJ_CONSTRAINT_CENTRIPETAL_ACCEL.CTL	
Z	X			N/A	TRAJ CONSTRAINT DIIF DRIVE KINEMATICS.CTL	
7				N/A	TRAJ_CONSTRAINT_DIIF_DRIVE_KINEMATICS.CTL TRAJ_CONSTRAINT_DIIF_DRIVE_VOLTAGE.CTL	
	^	_ ^	^_	1W/A	TITAL_CONCITATION _DITTEL_VOLTAGE.OTE	

ie iiite	erpolatable routines.											
1		Χ		N/A			TRAJ_CONSTRAINT_JERK.CTL		Routine exists, it is just a shell			
Ζ	X	X	Χ	N/A			TRAJ_CONSTRAINT_MECA_DRIVE_KINEMATICS.CTL					
Ζ	X	X	Χ	N/A			TRAJ_CONSTRAINT_MINMAX.CTL					
Z	X	X	Χ	N/A			TRAJ_CONSTRAINT_SWERVE_DRIVE_KINEMATICS.CTL					
Ζ	X	X	Χ	N/A			TRAJ_STATE.CTL					
Z	X	X	Χ	N/A			TRAJECTORY_SPLINE_TYPE_ENUM.CTL					
Z	X	X	Χ	N/A			TRAJECTORY.CTL					
Z	X	X		N/A			TRANSFORM2D.CTL					
Z	X	X	Χ	N/A			TRANSLATION2D.CTL					
Z	X	X	X	N/A			TRAPEZOID_PROFILE_CONSTRAINT.CTL					
Z	X	X	Χ	N/A			TRAPEZOID_PROFILE_STATE.CTL					
Z	X	X	Χ	N/A			TRAPEZOID_PROFILE.CTL					
Z	X	X		N/A			TWIST2D.CTL					
Z	X	X	X	N/A			UNSCENTED_KALMAN_CORRECT_FUNC_GROUP.CTL					
Z	X	X	Χ	N/A			UNSCENTED_KALMAN_FILTER.ctl					
Z	X	X	X	N/A			UNSCENTED_KALMAN_NEW_FUNC_GROUP.CTL					
Ζ	X	X	Χ	N/A			UTIL_PATHFINDER_CONFIG.CTL					
N/A		N/A		N/A			WAYPOINTS.CTL		Delete – obsolete			
Z	X	X	Χ	NA			WEIGHTED_WAYPOINT.CTL		New V1.5			
N/A		N/A		N/A			X_Y_HEADINGS.CTL		Delete – obsolete			
Z	X	X	X	N/A			X_Y_PAIR.CTL					