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 918 864 302 831 461 43 12 VI Total (X) 820 CTL Total (Z)
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Doc completed Pct 94.12% Optimization Pct 50.22%

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

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Revision 2.X 5/2/2022 – added implicit model follower and tin	ne interp	oolatable	routines	s.						
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Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines.

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Test Routine VI Name Function Prototype Notes X Χ ArmFF Calculate.vi XX X ArmFF_CalculateVelocityOnly.vi ArmFF Execute.vi LabVIEW style single call ArmFF ExecuteVelocityOnly.vi LabVIEW style single call Χ ArmFF_MaxAchieveAccel.vi X X Χ ArmFF MaxAchieveVelocity.vi X Χ XX ArmFF MinAchieveAccel.vi X XX ArmFF_MinAchieveVelocity.vi X X X Χ ArmFF_New_ZeroGravity.vi XX X ArmFF_New.vi Test Routine Not WPILIB Function Prototype Notes BANG BANG X X SI BangBang_AtSetpoint.vi X X SI BangBang_Calculate_PV.vi Χ Χ XX X SI BangBang_Calculate_SP_PV.vi Χ Χ X SI BangBang_Execute.vi Χ X SI BangBang_GetAll.vi Χ Χ X SI BangBang_GetError.vi XX X SI BangBang New.vi XX X SI BangBang SetSetpoint.vi XX X SI BangBang SetTolerance.vi Test Routine Not WPILIB est VI Name Function Prototype Notes This was short lived in WPILIB, but still useful here. CONTROLLER UTIL X SI ControllerUtil GetModulusError.vi Execution Optimized Test Routine Vot WPILIB Function Prototype Notes ELEV FF X X X X ElevFF Calculate.vi X ElevFF_CalculateVelocityOnly.vi Χ ElevFF_Execute.vi LabVIEW style single call ElevFF_ExecuteVelocityOnly.vi LabVIEW style single call ElevFF MaxAchieveAccel.vi

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

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	X	X		X	- 1		HolDrvCtrl_Calculate_Trajectory.vi	Added 1/26/21			
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	X	X		Χ	SI		HolDrvCtrl New.vi	Added 1/26/21			
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FRC LabVIEW Trajectory Library - VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. X X SI Ramsete SetEnabled.vi SetEnabled XX X SI Ramsete SetTolerance.vi SetTolerance XX XX Ramsete SINC.vi sinc internal Execution Optir Test Routine Not WPILIB Menu Function Prototype Notes SIMPLE MOTOR FEEDFORWARD $X \mid X$ X SI SimpleMotorFF Calculate CalcAccel.vi SimpleMotorFF Calculate NextV Dt.vi X SI SimpleMotorFF Calculate.vi XX X public double calculate(double velocity, double acceleration) XX X SI SimpleMotorFF CalculateVelocityOnly.vi public double calculate(double velocity) Χ Χ Χ SimpleMotorFF_MaxAchieveAccel.vi public double maxAchievableAcceleration(double maxVoltage, double velocity) X SimpleMotorFF MaxAchieveVel.vi public double maxAchievableVelocity(double maxVoltage, double X X public double minAchievableAcceleration(double maxVoltage, SimpleMotorFF MinAchieveAccel.vi Χ Χ Χ double velocity) SimpleMotorFF MinAchieveVel.vi public double minAchievableVelocity(double maxVoltage, double Χ Χ acceleration) X SI SimpleMotorFF New.vi public SimpleMotorFeedforward(double ks, double kv, double ka) X X public SimpleMotorFeedforward(double ks, double kv) '========= **GEOMETRY** '======== Test Routine lot WPILIB Execution VI Name **Function Prototype** Notes POSE X X X SI Pose Equals.VI boolean equals(other obj) X Pose Exp.vi pose2d exp(twist2d twist) XX X SI Pose getRotation.vi rotation2d getRotation() can also use cluster unpack XX X SI Pose getTranslation.vi translation2d getTranslation() can also use cluster unpack XX X X SI Pose_getXY.vi XX X X SI Pose_getXYAngle.vi $X \mid X$ X I Pose Interpolate.vi $X \mid X$ XX Pose Log.vi twist2d log(pose2d end) $X \mid X$ X SI Pose Minus.vi transform2d minus(pose2d other) $X \mid X$ X SI Pose New TRRO.vi pose2d new(translation2d, rotation2d) $X \mid X$ X SI Pose New.vi pose2d new(double x, double y, rotation2d) Pose Plus.vi XX X SI pose2d plus(transform2d other) Χ X X SI Pose RelativeTo.vi pose2d relativeto(pose2d other) XX X SI Pose TransformBy.vi pose2d transformby(transform2d other) can use cluster constant pose2d new() Execution Opt Routine Not WPILIB Menu Item Rei Test Function Prototype VI Name Notes ROTATION X X SI Rotation_CreateAngle.vi rotation2d new(double value) X Rotation_CreateAngleDegrees.vi X SI rotation2d fromDegrees(double degrees) convert to radians then create Χ X Χ X Χ SI Rotation_CreateAngleRotations.vi rotation2d new(double x, double y) $X \mid X$ X SI Rotation CreateXY.vi

boolean equals(rotation2d other)

New 1/26/21

X SI

X X X X SI

 $X \mid X$

Rotation Equals.vi

Rotation GetAngleCosSin.vi

V	del fo	ollower and tim	i <u>e inter</u>	rpolata										
TRANSPORM X X S Control (Selections V)			X	X					Rotation_GetCos.VI	double getCos()	use cluster unpack			
TRANSFORM			X	X		X	SI		Rotation_GetDegrees.VI	double getDegrees()	use cluster unpack, then convert to			
X														
X										double getRadians()	use cluster unpack			
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X X X X X N Relation Principle Relation Relati														
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TRANSFORM			X	X		X	SI		Rotation_UnaryMinus.vi					
TRANSFORM X X X S										rotation2d new()	can use cluster constant			
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TRANSLATION X X X S			<i>x</i>	<i>X</i>			pez	-	ransform_times.vi		can use cluster constant			
X					m		Optimized ine	ample Program		transform2d new()		ode Review	st Program	ror Checking
X X X SI Translation GetDistance.vi double getDistance(translation2d other)			Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized Test Routine	Sample Program	VI Name	transform2d new()		Code Review	Test Program	Error Checking
X X X SI Translation GetDistance.vi double getDistance(translation2d other)	Т	RANSLATION	X Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized Test Routine	Sample Program	VI Name Translation_Create_DistAng.vi	transform2d new() Function Prototype		Code Review	Test Program	Error Checking
X X X St	Т	RANSLATION	X Implemented	X Documented	Not WPILIB	X Menu Item	79 19 Execution Optimized Test Routine	Sample Program	VI Name Translation_Create_DistAng.vi Translation_Create.vi	Function Prototype translation2d new(double x, double y)		Code Review	Test Program	Error Checking
X X X X S S Translation_GetX.VI double getX() can use cluster unpack	T	RANSLATION	X X Implemented	X X Documented	Not WPILIB	X X Menu Item	9999 Secution Optimized Test Routine	Sample Program	VI Name Translation_Create_DistAng.vi Translation_Create.vi Translation_Equals.vi	Function Prototype translation2d new(double x, double y) boolean equals(translation other)		Code Review	Test Program	Error Checking
X X X X S	T	RANSLATION	X X Implemented	X X Documented	Not WPILIB	X Wenu ttem	19 19 19 Execution Optimized Test Routine	Sample Program	VI Name Translation_Create_DistAng.vi Translation_Create.vi Translation_Equals.vi Translation_GetDistance.vi	Function Prototype translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other)	Notes	Code Review	Test Program	Error Checking
X X X S	T	RANSLATION	X X X X X X X X X X X X X X X X X X X	X X Documented X X X	Not WPILIB	X X X X X X X X X X X X X X X X X X X	19 19 19 Execution Optimized Test Routine	Sample Program	VI Name Translation_Create_DistAng.vi Translation_Create.vi Translation_Equals.vi Translation_GetDistance.vi Translation_GetNorm.VI	Function Prototype translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm()	Notes can use cluster unpack	Code Review	Test Program	Error Checking
X X X S	Т	RANSLATION	X X X Implemented	X Documented X X X X	Not WPILIB	X X X X X X X X X X	19 19 19 Execution Optimized Test Routine	Sample Program	VI Name Translation_Create_DistAng.vi Translation_Create.vi Translation_Equals.vi Translation_GetDistance.vi Translation_GetNorm.VI Translation_GetX.VI	Function Prototype translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm()	Notes can use cluster unpack	Code Review	Test Program	Error Checking
X X X S	Т	RANSLATION	X X X X X X X X X X X X X X 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	19 19 19 Execution Optimized Test Routine	Sample Program	VI Name Translation_Create_DistAng.vi Translation_Create.vi Translation_Equals.vi Translation_GetDistance.vi Translation_GetNorm.VI Translation_GetX.VI Translation_GetXY.VI	Function Prototype translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX()	Notes can use cluster unpack can use cluster unpack	Code Review	Test Program	Error Checking
X X X SI Translation_Plus.vi translation2d plus (translation2d other)	Т	RANSLATION	X X X X X X X X X X X X X X 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	19 19 19 19 19 19 19 19 19 19 19 19 19 1	Sample Program	VI Name Translation_Create_DistAng.vi Translation_Create.vi Translation_Equals.vi Translation_GetDistance.vi Translation_GetNorm.VI Translation_GetX.VI Translation_GetXY.VI Translation_GetY.VI	Function Prototype translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX()	Notes can use cluster unpack can use cluster unpack	Code Review	Test Program	Error Checking
X X X S	т	RANSLATION	X X X X X X X X X X X X X X 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	19 19 19 19 19 19 19 19 19 19 19 19 19 1	Sample Program	VI Name Translation_Create_DistAng.vi Translation_Create.vi Translation_Equals.vi Translation_GetDistance.vi Translation_GetNorm.VI Translation_GetX.VI Translation_GetXY.VI Translation_GetY.VI Translation_GetY.VI Translation_Interpolate.vi	Function Prototype translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() double getY()	Notes can use cluster unpack can use cluster unpack	Code Review	Test Program	Error Checking
X X SI Translation_Times.vi translation2d times (double scalar)	Т	RANSLATION	X X X X X X X X X X X X X X 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	19 19 19 19 19 19 19 19 19 19 19 19 19 1	Sample Program	VI Name Translation_Create_DistAng.vi Translation_Create.vi Translation_Equals.vi Translation_GetDistance.vi Translation_GetNorm.VI Translation_GetX.VI Translation_GetXY.VI Translation_GetY.VI Translation_GetY.VI Translation_Interpolate.vi Translation_Minus.vi	Function Prototype translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() translation2d minus(translation2d other)	Notes can use cluster unpack can use cluster unpack	Code Review	Test Program	Error Checking
X X X SI Translation_UnaryMinus.vi translation2d unaryminus() can use cluster constant translation2d div(double scalar) Part of the par	Т	RANSLATION	X X X X X X X X X X X X X X 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	19 19 19 19 19 19 19 19 19 19 19 19 19 1	Sample Program	VI Name Translation_Create_DistAng.vi Translation_Create.vi Translation_Equals.vi Translation_GetDistance.vi Translation_GetNorm.VI Translation_GetX.VI Translation_GetX.VI Translation_GetY.VI Translation_GetY.VI Translation_Interpolate.vi Translation_Minus.vi Translation_Plus.vi	Function Prototype translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() translation2d minus(translation2d other) translation2d minus(translation2d other) translation2d plus(translation2d other)	Notes can use cluster unpack can use cluster unpack	Code Review	Test Program	Error Checking
translation2d new() translation2d div(double scalar) Test Wording We Wordi	Т	RANSLATION	X X X X X X X X X X X X X X 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	18 18 18 18 18 18 18 18	Sample Program	VI Name Translation_ Create_DistAng.vi Translation_ Create.vi Translation_ Equals.vi Translation_ GetDistance.vi Translation_ GetNorm.VI Translation_ GetX.VI Translation_ GetX.VI Translation_ GetY.VI Translation_ GetY.VI Translation_ Interpolate.vi Translation_Minus.vi Translation_Plus.vi Translation_RotateBy.vi	Function Prototype translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() translation2d minus(translation2d other) translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other)	Notes can use cluster unpack can use cluster unpack	Code Review	Test Program	Error Checking
translation2d div(double scalar) translation2d div(double scalar) can multiply by 1/scalar Leave of the mental of the month of the mental of the ment	Т	RANSLATION	X X X X X X X X X X X X X X 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	18 18 18 18 18 18 18 18	Sample Program	VI Name Translation Create_DistAng.vi Translation Create.vi Translation Equals.vi Translation GetDistance.vi Translation GetNorm.VI Translation GetX.VI Translation GetX.VI Translation GetY.VI Translation Interpolate.vi Translation Interpolate.vi Translation Plus.vi Translation Plus.vi Translation RotateBy.vi Translation_Times.vi	Function Prototype translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() translation2d minus(translation2d other) translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar)	Notes can use cluster unpack can use cluster unpack	Code Review	Test Program	Error Checking
Documented Documented Not WPILIB Menu Item Menu Item Menu Item Ample Program Test Routine Program Test Program Ferror Checking	Т	RANSLATION	X X X X X X X X X X X X X X 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	18 18 18 18 18 18 18 18	Sample Program	VI Name Translation Create_DistAng.vi Translation Create.vi Translation Equals.vi Translation GetDistance.vi Translation GetNorm.VI Translation GetX.VI Translation GetX.VI Translation GetY.VI Translation Interpolate.vi Translation Interpolate.vi Translation Plus.vi Translation Plus.vi Translation RotateBy.vi Translation_Times.vi	Function Prototype translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() translation2d minus(translation2d other) translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar) translation2d unaryminus()	Notes can use cluster unpack can use cluster unpack can use cluster unpack	Code Review	Test Program	Error Checking
	Т	RANSLATION	X X X X X X X X X X X X X X 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	18 18 18 18 18 18 18 18	Sample Program	VI Name Translation Create_DistAng.vi Translation Create.vi Translation Equals.vi Translation GetDistance.vi Translation GetNorm.VI Translation GetX.VI Translation GetX.VI Translation GetY.VI Translation Interpolate.vi Translation Interpolate.vi Translation Plus.vi Translation Plus.vi Translation RotateBy.vi Translation_Times.vi	Function Prototype translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() translation2d minus(translation2d other) translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar) translation2d unaryminus() translation2d new()	Notes can use cluster unpack can use cluster unpack can use cluster unpack can use cluster unpack	Code Review	Test Program	Error Checking
TWIST A A A ST TWIST Cleate.VI LWIST NEW(X, Y, theta)	Т	RANSLATION	X X X X X X X X X X X X X X 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	18 18 18 18 18 18 18 18	Sample Program	VI Name Translation Create_DistAng.vi Translation Create.vi Translation Equals.vi Translation GetDistance.vi Translation GetNorm.VI Translation GetX.VI Translation GetX.VI Translation GetY.VI Translation Interpolate.vi Translation Interpolate.vi Translation Plus.vi Translation Plus.vi Translation RotateBy.vi Translation_Times.vi	Function Prototype translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() translation2d minus(translation2d other) translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar) translation2d unaryminus() translation2d new()	Notes can use cluster unpack can use cluster unpack can use cluster unpack can use cluster unpack	Code Review	Test Program	Error Checking
	Т		Implemented X X X X X X X X X X X X X X X X X X X	Documented X X X X X X X X X X X X X X X X X X X	Not WPILIB	Menu Item X X X X X X X X X X X X X X X X X X X	Execution Optimized 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	ram	VI Name Translation_Create_DistAng.vi Translation_Create.vi Translation_Equals.vi Translation_GetDistance.vi Translation_GetNorm.VI Translation_GetX.VI Translation_GetXY.VI Translation_GetY.VI Translation_Interpolate.vi Translation_Minus.vi Translation_Plus.vi Translation_RotateBy.vi Translation_Times.vi Translation_UnaryMinus.vi	Function Prototype translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getX() double getX() 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		Program	Checking

Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. | X | X | X | SI | X | SI | X | X | X | X | SI | XX Twist Equals.VI boolean equals(obj other) Twist GetAll.VI '======== KINEMATICS '======== Test Routine Function Prototype Notes CHASSIS SPEEDS X ChassisSpeeds FromFieldRelativeSpeeds.VI chassisspeeds fromFieldRelativeSpeeds(double x, double y, SI double angvel, rotation2d robotangle) X X SI ChassisSPeeds_GetXYOmega.vi $X \mid X$ X SI ChassisSpeeds New.vi chassisspeeds new (double xvel, double yvel, double angvel) chassisspeeds new () can use cluster constant Function Prototype Notes DIFFERENTIAL DRIVE KINEMATICS X DiffKinematics_New.vi diffDriveKine new(double trackWidth) X X X $X \mid X \mid X$ DiffKinematics_toChassisSpeed.vi chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds) X SI X DiffKinematics toWheelSpeed.vi diffDriveWheelSpeed toWheelSpeeds(chassisSpeeds) Test Routine Not WPILIB Function Prototype DIFFERENTIAL DRIVE ODOMETRY DONT NEED DiffOdometry Execute.vi DiffOdometry_Update.vi pose2d update(rotation2d gyro, double leftdist, double right dist) Incorporates enhanced reset Χ diffDrOdom new(rotation gyro, pose initial) diffDrOdom new(rotation gyro) void resetPosition(pose2d, rotation2d) incorporated into "update" pose2d getPoseMeters() Test Routine Function Prototype Notes DIFFERENTIAL DRIVE WHEEL SPEEDS diffDrWheelSpeeds new() diffDrWheelSpeeds new(double leftVel, double rightVel) X X Χ DiffWheel Normalize.vi void normalize(double maxVel) Execution Op Test Routine Not WPILIB Function Prototype Notes MECANUM DRIVE KINEMATICS X X MecaKinematics New.vi XX MecaKinematics SetInverseKinematics.vi

sion 2.X 5/2/2022 – added implicit model follower and			le routi	nes.							
	X	X		X		s_ToChassisSpeeds.vi					
	X	X		X		s_ToWheelSpeeds.vi					
	X	_X	X	X	MecaKinematic	s_ToWheelSpeedsZeroCenter.vi					
	Implemented	Documented	Not WPILIB Menu Item	Execution Optimized Test Routine	Sample Program amen IA		Function Prototype	Notes	Code Review	Test Program	Error Checkina
MECANUM DRIVE MOTOR VOLTA	GE						7				
	nothing d	one									
	mplemented	Documented	vot wPILIB Menu Item	Execution Optimized Test Routine	Sample Program emen IA		Function Prototype	Notes	Code Review	Test Program	Error Checkina
MECANUM DRIVE ODOMET	RY		\overline{x}		MecaOdometry	Execute.vi	- anonomy rototype				
	X	X	X		MecaOdometry						
	X	X	X		MecaOdometry						
	X		X			_NewDefaultPose.vi					
	Χ		X		MecaOdometry						
	X		X		MecaOdometry	_Update.vi _UpdateWithTime.vi					
	nented	Documented	Not WPILIB Menu Item	Execution Optimize Test Routine	e Program				Review	rogram	bokina.
	olen	uno	2 20	Executior Test Rou	ldm				qe	st P	ż
	<u> </u>				წ VI Name		Function Prototype	Notes	ଓ	7e	, u
MECANUM DRIVE WHEEL SPEE		X	X		MecaWheel_Ne		public MecanumDriveWheelSpeeds(double frontLeftMetersPerSecond, double frontRightMetersPerSecond, double rearLeftMetersPerSecond, double rearRightMetersPerSecond)				
	X	X	X	X	MecaWheel_No	rmalize.vi	public void normalize(double attainableMaxSpeedMetersPerSecond)				
	mplemented	Documented Not Wall to	Not WPILIB Menu Item	Execution Optimized Test Routine	Sample Program electric state of the second		Function Prototype	Notes	Code Review	Test Program	
SWERVE DRIVE KINEMAT	cs X	\overline{X}	$\overline{X \mid X}$		SwerveKinema	cs New4.VI		For 4 module drives			
	X	X	XX		SwerveKinema	cs_NewX.VI		uses array as input			
	X	X	XX		SwerveKinema	cs_NormalizeWheelSpeeds.vi	public static void normalizeWheelSpeeds(SwerveModuleState[] moduleStates, double attainableMaxSpeedMetersPerSecond)				
			x x		SwerveKinema	cs_ToChassisSpeeds4.VI	mouuleotates, uouble attamableiviaxopeedivietersPeroecond)	For 4 module drives			
	X	X .		1 1	2.75.75141101110			uses array as input		1	
	X	$\frac{\lambda}{X}$	$X \mid X$		SwerveKinema	cs ToChassisSpeedsX.VI		uses array as iriput			
	X	XXX	X X X		SwerveKinema	cs_ToChassisSpeedsX.VI cs_ToSwerveModuleStates.VI	public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds, Translation2d centerOfRotationMeters)	uses array as input			
	X	XXX			SwerveKinema	cs_ToChassisSpeedsX.VI	toSwerveModuleStates(ChassisSpeeds chassisSpeeds, Translation2d centerOfRotationMeters) public SwerveModuleStateII	uses array as input			
	X	XXX	Х		SwerveKinema	cs_ToChassisSpeedsX.VI cs_ToSwerveModuleStates.VI	toSwerveModuleStates(ChassisSpeeds chassisSpeeds, Translation2d centerOfRotationMeters)	variable parameters (replace with array and "4" calls) variable parameters (replace with array and "4" calls)			

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Χ X No

SplineHelp ThomasAlgorithm.vi

Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. public double curvatureRadPerMeter. not needed, use cluster unpack Execution Op Test Routine Jot WPILIB Re VI Name Function Prototype Notes QUINTIC HERMITE SPLINE X private SimpleMatrix getControlVectorFromArrays(double[] QuinticHermiteSpline getControlVectorFromArrays.vi initialVector, double[] finalVector) QuinticHermiteSpline makeHermiteBasis.vi private SimpleMatrix makeHermiteBasis() X Χ Χ Χ QuinticHermiteSpline New.vi public QuinticHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector)
protected SimpleMatrix getCoefficients() not needed, use cluster unpack Routine Vot WPILIB **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 Optir Test Routine Jot WPILIB Aenu Item VI Name **Function Prototype** Notes SPLINE HELPER X SplineHelp GetCubicCtrlVector.vi private static Spline.ControlVector getCubicControlVector(double SI scalar, Pose2d point) public static Spline.ControlVector[] Χ SplineHelp GetCubicCtrlVectorsFromWayPts.vi getCubicControlVectorsFromWaypoints(Pose2d start, Translation2d[] interiorWaypoints, Pose2d end) $X \mid X$ $X \mid X$ SplineHelp GetCubicCtrlVectorsFromWeightedWayPts.vi X No SplineHelp_GetCubicSpline_Calc1.vi X internal SplineHelp_GetCubicSpline_Calc2.vi Χ X No internal X No SplineHelp GetCubicSpline Calc3.vi Χ X internal SplineHelp getCubicSplinesFromControlVectors.vi public static CubicHermiteSpline[] Χ Χ getCubicSplinesFromControlVectors(Spline.ControlVector start, Translation2d[] waypoints, Spline.ControlVector end)
private static Spline.ControlVector getQuinticControlVector(double SplineHelp GetQuinticCtrlVector.vi Χ Χ SI scalar, Pose2d point) SplineHelp GetQuinticCtrlVectorsFromWayPts.vi public static List<Spline.ControlVector> REMOVED 2762 getQuinticControlVectorsFromWaypoints(List<Pose2d> waypoints) SplineHelp_GetQuinticCtrlVectorsFromWeightedWayPts.vi REMOVED 2762 SplineHelp getQuinticSplinesFromControlVectors.vi public static QuinticHermiteSpline[] Χ Χ X getQuinticSplinesFromControlVectors(Spline.ControlVector[] controlVectors) XX XX SplineHelp GetQuinticSplinesFromWeightedWayPts.vi New 2762 X X X SplineHelp GetQuinticSplinesFromWayPts.vi New 2762

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private static void thomasAlgorithm(double[] a, double[] b, double[] internal

c, double[] d, double[] solutionVector)

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Trajectory Sample.vi

Trajectory SampleReverse.vi

Trajectory TransformBy.vi

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
TRAJECTORY_STATE	X	X		X	SI		TrajectoryState_Equals.vi	boolean equals(other obj)				
	X	X	X	X	SI		TrajectoryState_GetAll.vi					
	X	X		X	SI		TrajectoryState_GetPose.vi					
	X	X		X			TrajectoryState_Interpolate.vi	State interpolate(State endValue, double i)				
	X	X		X	SI		TrajectoryState_New.vi	public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State()				

public State sample(double timeSeconds)

public Pose2d getInitialPose()

public Trajectory transformBy(Transform2d transform)

Sample in reverse order. Negate

can use cluster unpack, array index

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public ControlVectorList()

may not need, just data

Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. public ControlVectorList(Collection<? extends may not need, just data Spline.ControlVector> collection) Execution Op Test Routine Not WPILIB Function Prototype Notes TRAJECTORY PARAMETERIZE X X X No TrajectoryParam calcStuffFwd.vi XX X No TrajectoryParam_calcStuffRev.vi X TrajectoryParam enforceAccel.vi private static void enforceAccelerationLimits(boolean reverse, This routines needs to be changed List<TrajectoryConstraint> constraints, ConstrainedState state) hen new constraints are added. X TrajectoryParam enforceVelocity.vi X No This routines needs to be changed public static Trajectory X X X TrajectoryParam timeParam.vi timeParameterizeTrajectory(List<PoseWithCurvature> points. List<TrajectoryConstraint> constraints, double startVelocityMetersPerSecond, double endVelocityMetersPerSecond, double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq, boolean reversed) Execution Op Test Routine Vot WPILIB Menu Item Function Prototype VI Name Notes TRAJECTORY PARAMETERIZE CONSTRAINED STATE X ConstrainedState New.vi ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double maxAccelerationMetersPerSecondSq) X X X X ConstrainedState SetMaxAccel.vi X X X X ConstrainedState SetMinAccel.vi X X X X ConstrainedState SetVelAccel.vi X X X X ConstrainedState SetVelocity.vi ConstrainedState() Execution Op Test Routine Vot WPILIB Function Prototype Notes TRAJECTORY UTIL X X TrajectoryUtil_fromPathWeaverJSON.vi public static Trajectory fromPathweaverJson(Path path) X XX X X X TrajectoryUtil_MakeWeightedWayPoint_ENG.vi XX X X X TrajectoryUtil_MakeWeightedWayPoint.vi Χ TrajectoryUtil_toPathWeaverJSON.vi public static void toPathweaverJson(Trajectory trajectory, Path X public static Trajectory deserializeTrajectory(String json) public static String serializeTrajectory(Trajectory trajectory) Execution Optii Test Routine Vot WPILIB Function Prototype Notes TRAPEZOID PROFILE X TrapProfConstraint_New.vi X X X Χ TrapProfile_Calculate.vi XX TrapProfile Direct.vi No Private, remove from menu

ume me	rpolai	lable	loulii	es.		
X	X	X	X		TrapProfile_Execute.vi	
X	X	X	X	SI	TrapProfile_Execute_AtGoal.vi	
X	X		X		TrapProfile_IsFinished.vi	
X	X		X		TrapProfile_New_DefInitial.vi	
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	
X	X		X		TrapProfState_New.vi	

	X	X		X				TrapProfState_Equals.vi		
l	X	X		X				TrapProfState_New.vi		
'======= TRAJECTORY CONSTRAINT										
CENTRIPETAL ACCELERATION CONSTRAINT	X Implemented	X Documented	Not WPILIB	X Menu Item	ত Execution Optimized	Test Routine		CentripetalAccelConstraint_getMaxVelocity.vi CentripetalAccelConstraint_getMinMaxAccel.vi CentripetalAccelConstraint_New.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	Notes Can use cluster pack for now
DIFF DRIVE KINEMATIC CONSTRAINT	X Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine		DiffDriveKinematicsConstraint getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d	Notes
	X	X		X				DiffDriveKinematicsConstraint_getMinMaxAccel.vi	poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X	SI			-	public DifferentialDriveKinematicsConstraint(final DifferentialDriveKinematics kinematics, double maxSpeedMetersPerSecond)	
DIFF DRIVE VOLTAGE CONSTRAINT	X Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine	Sample Program	DiffDriveVoltageConstraint getMaxVelocity.vi	Function Prototype public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	Notes
	X	X		X					public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X	SI			° –	public DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	

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Util_ApproxEqual.vi

e inte	nterpolatable routines.								
X	X	X	X			Util_Array_PoseWCurv_to_XY.vi			
X	X	X	X	SI		Util_CalcDist.vi			
X	X	Χ	X	SI		Util_GetLibraryVersion.vi			
X	Χ	Χ	X	SI		Util_GetLibUsage.vi			
X	X	X	X			Util_GetTime.vi	Once tested completely, this should be optimized!		
X	X	Χ	No	N/A		Util_LibraryGlobals.vi	Global Variables – no block diag.		
X	X	X	X			Util_Trajectory_Absolute_To_Relative.vi			
X	X	X	X			Util_Trajectory_ReadFile.vi			
X	X	X	X			Util_Trajectory_to_XY.vi			
X	X	X	No			Util_Trajectory_WriteFile_Config.vi	internal		
X	X	X	No			Util_Trajectory_WriteFile_OneState.vi	internal		
X	X	X	X			Util_Trajectory_WriteFile_PathFinder.vi			
X	X	X	No			Util_Trajectory_WriteFile_PathFinderConfig.vi	internal		
X	X	X	X			Util_Trajectory_WriteFile_Pathweaver.vi			
X	X	X	No			Util_Trajectory_WriteFile_States.vi	internal		
X	X	X	No			Util_Trajectory_WriteFile_WayPoints.vi	internal		
X	X	X	X			Util_Trajectory_WriteFile.vi			
X	X	X	X			Util_TrajectoryState_Meters_To_Inches.vi			
X	X	X	X			Util_TrajState_to_DiffDrive_WheelPos.vi			
X	X	Χ	X			Util_Waypoint_Eng_To_SI.vi			
Χ	X	X	X			Util_Waypoint_To_CubicInput.vi			
X	X	X	X			Util_Waypoint_To_QuinticInput.vi			
X	X	X	X			Util_WeightedWaypiont_Eng_To_WeightedWaypoint			
X	Χ	Χ	No			Util_WeightedWayPoint_To_WeightedWayPoint.vi	Sorry about the confusing name		

'======== CONVERSIONS

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

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

Not WPILIB

Function Prototype Notes

wer and time	e inte	rpolat	able	routin	es.
UNITS	X	X		X	

tim <u>e</u> i	e interpolatable routines.									
TS	X	X		Χ	SI		Units_DegreesToRadians.vi			
	X	Χ		Χ	SI		Units_DegreesToRotations.vi			
	X	Χ		Χ	SI		Units_FeetToMeters.vi			
	X	Χ		Χ	SI		Units_InchesToMeters.vi			
	X	Χ		Χ	SI		Units_MetersToFeet.vi			
	X	Χ		Χ	SI		Units_MetersToInches.vi			
	X	Χ		Χ	SI		Units_MillisecondsToSeconds.vi			
	X	Χ		Χ	SI		Units_RadiansPerSecondToRotationsPerMinute.vi			
	X	Χ		Χ	SI		Units_RadiansToDegrees.vi			
	X	Χ		Χ	SI		Units_RadiansToRotations.vi			
	X	Χ		Χ	SI		Units_RotationsPerMinuteToRadiansPerSecond.vi			
	X	Χ		Χ	SI		Units_RotationsToDegrees.vi			
	X	Χ		Χ	SI		Units_RotationsToRadians.vi			
	X	Χ		Χ	SI		Units_SecondsToMilliseconds.vi			

'========

PATHFINDER UTIL

'========

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

JAVA / C++ WPILIB EQUIVALENT

Test Routine Not WPILIB

Function Prototype Notes PathfinderUtil_Continuous_Heading_Difference.vi
PathfinderUtil_OptimizeTrajectoryStates.vi PathfinderUtil_ToTrajectory.vi
PathfinderUtil_ToTrajectoryStates.vi

'========

STATE SPACE MODEL

'======

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Ample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
DC MOTOR	Χ	X			SI		DCMotor_GetAndymark9015.vi					
	Χ	X			SI		DCMotor_GetAndymarkRs775_125.vi					
	Χ	X			SI		DCMotor_GetBag.vi					
	Χ	X			SI		DCMotor_GetBanebotsRs550.vi					
	X	X			SI		DCMotor_GetBanebotsRs775.vi					
	X	X			SI		DCMotor_GetCIM.vi					
	Χ	X			SI		DCMotor_GetCurrent.vi					
	X	X			SI		DCMotor_GetFalcon500.vi					
	Χ	X		Χ	SI		DCMotor_GetMiniCIM.vi					
	Χ	X			SI		DCMotor_GetNEO.vi					
	X	X			SI		DCMotor_GetNEO550.vi					
	Χ	X		_	SI		DCMotor_GetRomiBuiltIn.vi					
	Χ	X		Χ	SI		DCMotor_GetVex775Pro.vi					
	Χ	X			SI		DCMotor_New.vi					
	Χ	X		Χ	SI		DCMotor_PickMotor.vi					
										1		

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FRC LabVIEW Trajectory Library – VI Implementation L											
Revision 2.X 5/2/2022 – added implicit model follower and time	interpo	latable	routir	nes.							
	mplemented	ocumented Vot WPILIB	Jenu Item	Execution Optimized	Fest Routine Sample Program	√I Name	Function Prototype	Notes	Sode Review	est Program	error Checking
LINEAR SYSTEM ID	$\frac{1}{X}$	(_ <u><</u>	F		LinearSystemId CreateDriveTrainVelocitySystem.vi	undignative	Update to use create matrix			
	XX		X			LinearSystemId CreateElevatorSystem.vi		Update to use create matrix			
	XX		X		L	_inearSystemId_CreateFlywheelSystem.vi		Update to use create matrix			
	X X		X		L	LinearSystemId_CreateSingleJointedArmSystem.vi		Update to use create matrix			
	$X \mid X$	(X		L	_inearSystemId_IdentifyDriveTrainSystem.vi		Update to use create matrix			
	X X	(X		L	_inearSystemId_IdentifyPositionSystem.vi		Update to use create matrix			
	XX	(X			_inearSystemId_IdentifyVelocitySystem.vi		Update to use create matrix			

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

=				Q								
	þ	~ ¢		Optimized	ø	gram				W	E.	king
	mplementec	Documenter Not WPILIB	Menu Item	Execution (Test Routine	le Progr				Revie	Fest Program	Checking
	ple	Z CC	nu	ecr	st F	du	VI Name			Code	st F	Error
				Ě	7e	Sa	VI Name	Function Prototype	Notes	္ ပိ		En
DIFFERENTIAL DRIVE POSE ESTIMATOR			X				DiffDrivePoseEst_AddVisionMeasurement.vi					
	Χ	X	X				DiffDrivePoseEst_FillStateVector.vi					
	Χ	X	X				DiffDrivePoseEst_GetEstimatedPosition.vi					
	Χ		X				DiffDrivePoseEst_Kalman_F_Callback.vi					
	Χ	X	X				DiffDrivePoseEst_Kalman_H_Callback.vi					
	Χ		X				DiffDrivePoseEst_New.vi					
	Χ		X				DiffDrivePoseEst_ResetPosition.vi					
	Χ		X				DiffDrivePoseEst_SetVisionMeasurementStdDevs.vi					
	Χ		X				DiffDrivePoseEst_Update.vi					
	Χ		X				DiffDrivePoseEst_UpdateWithTime.vi					
	Χ	X	X				DiffDrivePoseEst_VisionCorrect_Callback.vi					
	X	v										
·		<i>X</i>	X				DiffDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi					
	Implemented	Documented Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
EXTENDED KALMAN FILTER	X Implemented	X Documented Not WPILIB	X Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct_OnlyUY.vi	Function Prototype		Code Review	Test Program	Error Checking
EXTENDED KALMAN FILTER	X X Implemented	X X Documented Not WPILIB	X Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_Correct.vi	Function Prototype	Notes Just a shell, not functional!	Code Review	Test Program	Error Checking
EXTENDED KALMAN FILTER	X X Implemented	X X Documented Not WPILIB	X X Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_GetP_Single.vi	Function Prototype		Code Review	Test Program	Error Checking
EXTENDED KALMAN FILTER	X X Implemented	X X X Documented Not WPILIB	X X Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_GetP_Single.vi ExtendedKalmanFilter_GetP.vi	Function Prototype		Code Review	Test Program	Error Checking
EXTENDED KALMAN FILTER	X X Implemented	X X X X Documented Not WPILIB	X X Wenu Item	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_GetP_Single.vi ExtendedKalmanFilter_GetP.vi ExtendedKalmanFilter_GetXHat_Single.vi	Function Prototype		Code Review	Test Program	Error Checking
EXTENDED KALMAN FILTER	X X X X X X X X X X X X X X X X X X X	X X X Documented X X W IN	X X X X X X X X X X X X X X X X X X X	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_GetP_Single.vi ExtendedKalmanFilter_GetP.vi ExtendedKalmanFilter_GetXHat_Single.vi ExtendedKalmanFilter_GetXHat_Single.vi	Function Prototype		Code Review	Test Program	Error Checking
EXTENDED KALMAN FILTER	X X X X X X X X X X X X X X X X X X X	X X Documented X X X Not WPILIB	X X Wenu Item	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_GetP_Single.vi ExtendedKalmanFilter_GetP.vi ExtendedKalmanFilter_GetXHat_Single.vi ExtendedKalmanFilter_GetXHat_Single.vi ExtendedKalmanFilter_GetXHat.vi ExtendedKalmanFilter_New.vi	Function Prototype		Code Review	Test Program	Error Checking
EXTENDED KALMAN FILTER	X X X X X X X X X X X X X X X X X X X	X X Documented X X X Not WPILIB	X X X X X X X X X X X X X X X X X X X	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_GetP_Single.vi ExtendedKalmanFilter_GetP.vi ExtendedKalmanFilter_GetXHat_Single.vi ExtendedKalmanFilter_GetXHat_vi ExtendedKalmanFilter_GetXHat.vi ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi	Function Prototype		Code Review	Test Program	Error Checking
EXTENDED KALMAN FILTER	X X X X X X X X X X X X X X X X X X X	X X Documented X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_GetP_Single.vi ExtendedKalmanFilter_GetP.vi ExtendedKalmanFilter_GetXHat_Single.vi ExtendedKalmanFilter_GetXHat.vi ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Reset.vi	Function Prototype		Code Review	Test Program	Error Checking
EXTENDED KALMAN FILTER	X X X X X X X X X X X X X X X X X X X	X X Documented X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_GetP_Single.vi ExtendedKalmanFilter_GetP.vi ExtendedKalmanFilter_GetXHat_Single.vi ExtendedKalmanFilter_GetXHat.vi ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Reset.vi ExtendedKalmanFilter_Reset.vi	Function Prototype		Code Review	Test Program	Error Checking
EXTENDED KALMAN FILTER	X X X X X X X X X X X X X X X X X X X	X X Documented X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_GetP_Single.vi ExtendedKalmanFilter_GetP.vi ExtendedKalmanFilter_GetXHat_Single.vi ExtendedKalmanFilter_GetXHat.vi ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Reset.vi ExtendedKalmanFilter_SetP.vi ExtendedKalmanFilter_SetYHat_Single.vi	Function Prototype		Code Review	Test Program	Error Checking
EXTENDED KALMAN FILTER	X X X X X X X X X X X X X X X X X X X	X X Documented X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_GetP_Single.vi ExtendedKalmanFilter_GetP.vi ExtendedKalmanFilter_GetXHat_Single.vi ExtendedKalmanFilter_GetXHat.vi ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Reset.vi ExtendedKalmanFilter_Reset.vi	Function Prototype		Code Review	Test Program	Error Checking

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	Implen	Docum	Not WI	Menu I	Execut	Test R	VI Name	Function Prototype	Notes	Code F	Test P	Error C
KALMAN FILTER LATENCY COMPENSATOR	Χ	Χ		Χ			KalmanFilterLatencyComp_AddObserverState.vi					
	Χ	X		X			KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi					
	Χ	Χ		X			KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v					
	Χ	X		Χ			KalmanFilterLatencyComp_FindClosestMeasurement.vi					
	Χ	X		Χ			KalmanFilterLatencyComp_New.vi					
	Χ	X		Χ			KalmanFIlterLatencyComp_Observer_New.vi					
	Χ	X		Χ			KalmanFilterLatencyComp_Reset.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Op	Test Routine	Nample Progr	Function Prototype	Notes	Code Review	Test Program	Error Checkin
SWERVE DRIVE POSE ESTIMATOR							SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi					
	Χ	Χ		Χ			SwerveDrivePoseEst_AddVisionMeasurement.vi					
	Χ	Χ		Χ			SwerveDrivePoseEst_GetEstimatedPosition.vi					
	Χ	Χ		Χ			SwerveDrivePoseEst_Kalman_F_Callback.vi					
	Χ	Χ		Χ			SwerveDrivePoseEst_Kalman_H_Callback.vi					
	X	Χ		Χ			SwerveDrivePoseEst_New.vi					
	Χ	Χ		Χ			SwerveDrivePoseEst_ResetPosition.vi					
	Χ	Χ		Χ			SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi					
	Χ	Χ		Χ			SwerveDrivePoseEst_Update.vi					
	X	Χ		Χ			SwerveDrivePoseEst_UpdateWithTime.vi					
	X	Χ		Χ			SwerveDrivePoseEst_VisionCorrect_Callback.vi					
	Χ	Χ		Χ			SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi					

Implemented Documented Not WPILIB Menu Item Execution Optimized Test Routine Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
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Notes

added implicit model follower	and unit	5 IIIICI	polai	abici	Ou
UNSCENTED KALMAN	FILTER	Χ	Χ		X

		polatable	Toutillos.	•	
ER	X	X	X		UnscentedKalmanFilter_Correct_FuncGroup.vi
	X	X	X		UnscentedKalmanFilter_Correct_OnlyUY.vi
	X	X	X		UnscentedKalmanFilter_Correct_OnlyUYR.vi
	X	X	X		UnscentedKalmanFilter_Correct.vi
	X	X	X		UnscentedKalmanFilter_GetP_Single.vi
	X	X	X		UnscentedKalmanFilter_GetP.vi
	X	X	X		UnscentedKalmanFilter_GetXHat_Single.vi
	X	X	X		UnscentedKalmanFilter_GetXHat.vi
	X	X	X		UnscentedKalmanFilter_New_Default.vi
	X	X	X		UnscentedKalmanFilter_New_FuncGroup.vi
	X	X	Х		UnscentedKalmanFilter_New.vi
	X	X	X		UnscentedKalmanFilter_Predict.vi
	X	X	X		UnscentedKalmanFilter_Reset.vi
	X	X	X		UnscentedKalmanFilter_SetP.vi
	X	X	X		UnscentedKalmanFilter_SetXHat_Single.vi
	X	X	Х		UnscentedKalmanFilter_SetXHat.vi
	X	X	X		UnscentedKalmanFilter_Transform.vi

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

CONTROL AFFINE PLANT INVERSION FEEDFORWARD	Implemented	Documented	Not WPILIB	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE ACCELERATION LIMITER	X X Implemented	Documented	2	Execution Optimized	X X Test Routine	Sam	VI Name DiffDrvAccelLimit_Calculate.vi DiffDrvAccelLimit_New.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
IMPLICIT MODEL FOLLOWED	(Implemented	Documented		Execution Optimized	Test	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
IMPLICIT MODEL FOLLOWER	X			X X	X		ImplModelFollow_Calculate.vi ImplModelFollow_GetU.vi					
	Χ			X	X		ImplModelFollow_GetU_Single.vi					
	Χ			X	X		ImplModelFollow_New.vi					
	Χ			X	X		ImplModelFollow_New_Plant.vi					
	Χ			X	X		ImplModelFollow_Reset.vi					
						- [

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.X 5/2/2022 – added implicit model follower and t	ime inter	polatal	ole routir	nes.						
	ď	Ø		Optimized	gram			<i>\ge\</i>	E	
	nente	Documentea	PILIB tem	Execution Op Test Routine	ο Ο			Revie	Progra	
	nplen	ocun	Not WPILIB Menu Item	Execution Test Routi	dd war y Marra	Function Destatus	Notes	Code I	Test P	
LINEAR PLANT INVERSION FEEDFORWAR	>n		<u> </u>		∀ VI Name LinearPIntInvFF Calculate NextR.vi LinearPIntInvFF Calculate NextR.vi LinearPIntInvFF Calculate NextR	Function Prototype	Notes			$\overline{}$
LINEART EART INVERSION FEED ORWAI	X		X		LinearPIntInvFF_Calculate.vi			+		+
	X	X	X		LinearPIntInvFF_GetR_Single.vi			1		+
	X	X	X		LinearPIntInvFF GetR.vi					\top
	X	X	X		LinearPIntInvFF_GetUff_Single.vi					T
	X	X	X		LinearPIntInvFF_GetUff.vi					
	X		X		LinearPIntInvFF_New_Plant.vi					\perp
	X	_X	X		LinearPIntInvFF_New.vi					\perp
	X	X	X		LinearPIntInvFF_Reset_Initial.vi			 '		\perp
	X	$\stackrel{\times}{-}$	X		LinearPIntInvFF_Reset_Zero.vi			+		+
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	Idu	Documented	Not WPILIB Menu Item	Execution Op Test Routine	S VI Name	Function Prototype	Notes	Code	Test Program	
LINEAR QUADRATIC REGULATO	SRX		< X		LinearQuadraticRegulator_Calculate_NextR.vi	unclion r rolotype	Notes	\top		Т
	X		X		LinearQuadraticRegulator_Calculate.vi			+		+
	X	X	X		LinearQuadraticRegulator GetK Single.vi		NOT ORIGINAL			\top
	X	X	X	X	LinearQuadraticRegulator_GetK.vi					T
	X	X	X		LinearQuadraticRegulator_GetR_Single.vi					
	X	X	X		LinearQuadraticRegulator_GetR.vi					\perp
	X	_X	X		LinearQuadraticRegulator_GetU_Single.vi					\perp
	X	_X	X		LinearQuadraticRegulator_GetU.vi					_
	/	X	X	X	LinearQuadraticRegulator_LatencyCompensate.vi		Routine exists, but it only has	4 '	1	
	X	-			LinearQuadraticRegulator_New_ELMS.vi		interger raise matrix to power.	4		+
	X	$\frac{2}{}$	X		LinearQuadraticRegulator_New_ELMS.vi LinearQuadraticRegulator_New_N.vi			+		+
	^				LinearQuadraticRegulator_New_Raw.vi			+		+
	X	$\overline{\mathbf{x}}$	X	X	LinearQuadraticRegulator New SystemFLMS vi			+		+
	X	$\frac{x}{x}$	X		LinearQuadraticRegulator_New_SystemELMS.vi LinearQuadraticRegulator_New.vi			+		+
	X X X	X	X		LinearQuadraticRegulator Reset.vi			+		\top
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	<u> </u>					Function Prototype	Notes	8		
LINEAR SYSTE	EM X	_X	X	1	LinearSystem_CalculateX.vi					\perp
LINEAROIOIL	X	X	X	1	LinearSystem_CalculateY.vi			'		\perp
LINEAROTOTE	V	<u>X</u>	$\frac{X}{X}$	SI SI	LinearSystem_GetA.vi			+		+
EMEAROTOTE	<u> </u>		1 Y	$\perp SI$	LinearSystem_GetAElement.vi			+		+
EINEAROTOTE	X	$\frac{x}{x}$	- X	0,	Lineau Cychana Cat Dyd					- 1
EINEAROTOTE	X X X X	X	X	SI	LinearSystem_GetB.vi			+	-	+
EINEAROTOTE	X	X	X	SI SI	LinearSystem_GetBElement.vi			+		‡
EINEAROTOTE	X	X	X X X	SI SI	LinearSystem_GetBElement.vi LinearSystem_GetC.vi					
EINEAROTOTE	X X X	X X X	X X X X	SI SI SI	LinearSystem_GetBElement.vi LinearSystem_GetC.vi LinearSystem_GetCElement.vi					
EINEAROTOTE	X	X X X	X X X X	SI SI	LinearSystem_GetBElement.vi LinearSystem_GetC.vi					‡ ‡

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x 5/2/2022 - added implicit model follower and tir	n List						
2.X 5/2/2022 – added implicit model follower and tir	ne interpolatable routines.						
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LINEAR SYSTEM LOO	OP X X X	LinearSystemLoop_ClampInput.vi	71				
	XXXX	LinearSystemLoop_Correct.vi					
	A A A	LinearSystemLoop GetClampFunction.vi					
	X X X	LinearSystemLoop_GetController.vi					
	XXXX	LinearSystemLoop_GetError_Single.vi					
	X X X	LinearSystemLoop_GetError.vi					
	X X X	LinearSystemLoop_GetFeedForward.vi					
	X X X	LinearSystemLoop_GetNextR_Single.vi					
	X X X	LinearSystemLoop_GetNextR.vi					
	X X X	LinearSystemLoop GetObserver.vi					
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	X X X	LinearSystemLoop_GetU.vi					
		LinearSystemLoop_GetXHat_Single.vi					
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	V V	LinearSystemLoop_New_LinearSystem_ClampFunc					
	X X X	LinearSystemLoop_New_LinearSystem_ClampVal.vi					
	X X X	LinearSystemLoop_New.vi					
	X X X	LinearSystemLoop_Predict.vi					
	X X X	LinearSystemLoop_Reset.vi					
		LinearSystemLoop_SetClampFunction.vi					
	V V	LinearSystemLoop_SetNextR_Some.vi					
	X X X	LinearSystemLoop_SetNextR.vi					
		LinearSystemLoop_SetXHat_Single.vi					
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	X X X X			CallbackHelp_MatrixMult.vi					
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STATE SPACE UTIL	. X X X No X X X X	Execution Test Ro		StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi	Function Prototype		Code Re	Test Prog	Error Chec
STATE SPACE UTIL	X X X No X X X X X X X X			StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi StateSpaceUtil_IsDetectable.vi StateSpaceUtil_IsStabalizable.vi	Function Prototype	Internal routine	Code Re	Test Prog	Error Chec
STATE SPACE UTIL	X X X No X X X X X X X X X X X X	X		StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi StateSpaceUtil_IsDetectable.vi StateSpaceUtil_IsStabalizable.vi StateSpaceUtil_MakeCostMatrix.vi	Function Prototype	Internal routine	Code Re	Test Prog	Error Chec
STATE SPACE UTIL	X X X No X X X X X X X X X X X X X X X X			StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi StateSpaceUtil_IsDetectable.vi StateSpaceUtil_IsStabalizable.vi StateSpaceUtil_MakeCostMatrix.vi StateSpaceUtil_MakeCovarianceMatrix.vi	Function Prototype	Internal routine	Code Re	Test Prog	Error Chec
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STATE SPACE UTIL	X X X No X	X		StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi StateSpaceUtil_IsDetectable.vi StateSpaceUtil_IsStabalizable.vi StateSpaceUtil_MakeCostMatrix.vi StateSpaceUtil_MakeCovarianceMatrix.vi StateSpaceUtil_MakeWhiteNoiseVector.vi StateSpaceUtil_NomalizeInputVector.vi	Function Prototype	Internal routine	Code Re	Test Prog	Error Chec
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	X	X	λ		DCMotorSim_getAngularVelocityRadPerSec.vi					
	X	X	λ		DCMotorSim_getAngularVelocityRPM.vi					
		X	X	,	DCMotorSim_GetCurrentDrawAmps.vi					
	X	$\frac{x}{x}$	X	,	DCMotorSim_New_MOI.vi					
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			+		DCMotorSim_SetInputVoltage.vi					
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	X	X	\ X	(DiffDriveTrainSim_GetHeading.vi					
	X	X	λ		DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi					
	X	X	λ	(DiffDriveTrainSim_GetLeftPositionMeters.vi					
	X	X	X	(DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi					
	X	X	λ	(DiffDriveTrainSim_GetOutput_Single.vi					
	X	x	X	,	DiffDriveTrainSim_GetPose.vi					
	X	X	λ	,	DiffDriveTrainSim_GetRightCurrentDrawAmps.vi					
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					DiffDriveTrainSim_GetState_Single.vi					
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	X	X	λ		DiffDriveTrainSim_GetState.vi					
	Χ	Χ	λ		DiffDriveTrainSim_KitBotWheelSize.vi					
		X	λ		DiffDriveTrainSim_New_Mass_MOI.vi					
	X	X	λ		DiffDriveTrainSim_New.vi					
	X	X	λ		DiffDriveTrainSim_SetCurrentGearing.vi					
	X	X	λ	(DiffDriveTrainSim_SetInputs.vi					
	X	X	X	(DiffDriveTrainSim_SetPose.vi					
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ELEVATOR SIM	X	ΧI	X		ElevatorSim GetCurrentDraw.vi				. 1	

FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. Χ ElevatorSim GetPositionMeters.vi XX Χ ElevatorSim GetVelocityMetersPerSecond.vi XX Χ ElevatorSim_HasHitLowerLimit.vi XX Χ ElevatorSim_HasHitUpperLimit.vi ElevatorSim_New_LinSys_NoNoise.vi ElevatorSim New LinSys.vi ElevatorSim New NoNoise.vi XX X ElevatorSim New.vi ElevatorSim RKF45 Func.vi $X \mid X$ X No XX ElevatorSim SetInputVoltage.vi Χ XX ElevatorSim SetState.vi X ElevatorSim_Update.vi Needed because this doesn't X X XX Χ ElevatorSim UpdateX.vi XX Χ ElevatorSim WouldHitLowerLimit.vi XX Χ ElevatorSim WouldHitUpperLimit.vi Execution Optimized Test Routine Vot WPILIB Function Prototype Notes FLYWHEEL SIM X X FlyWheelSim_GetAngularVelocityRadPerSec.vi X XX Χ FlyWheelSim GetAngularVelocityRPM.vi X X FlyWheelSim GetCurrentDrawAmps X FlyWheelSim_New_LinSys Future FlyWheelSim_New_LinSys_MOI_NoNoise Future FlyWheelSim_New_LinSys_NoNoise Future $X \mid X$ Χ FlyWheelSim New MOI.vi $X \mid X$ Χ FlyWheelSim SetInput.vi $X \mid X$ Χ FlyWheelSim SetState.vi FlyWheelSim Update.vi $X \mid X$ Χ Execution Opti Test Routine Vot WPILIB Function Prototype Notes LINEAR SYSTEM SIM X X LinearSystemSim ClampInput.vi LinearSystemSim GetCurrentDrawAmps.vi DONT IMPLEMENT. $X \mid X$ X LinearSystemSim GetOutput Single.vi XX Χ LinearSystemSim GetOutput.vi $X \mid X$ Χ LinearSystemSim New LinearSystemSim New NoNoise.vi X X LinearSystemSim SetInput Array.vi X Doesn't use clamp? XX LinearSystemSim_SetInput_Single.vi X LinearSystemSim_SetInput.vi XX Χ XX Χ LinearSystemSim_Setstate.vi LinearSystemSim_Update.vi XX X XX No LinearSystemSim_UpdateX.vi X X X No LinearSystemSim UpdateY.vi rest Program Test Routine Not WPILIB ecution (

SngJntArmSim EsitmateMOI.vi

Function Prototype

Notes

SINGLE JOINT ARM SIM X X

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X	X	X		SngJntArmSim_GetAngleRads.vi
X	X	X		SngJntArmSim_GetCurrentDraw.vi
X	X	X		SngJntArmSim_GetVelocityRadsPerSec.vi
X	X	X		SngJntArmSim_HasHitLowerLimit.vi
X	X	X		SngJntArmSim_HasHitUpperLimit.vi
X	X	X		SngJntArmSim_New.vi
X	X	No		SngJntArmSim_Rkf45_Func.vi
X	X	X		SngJntArmSim_SetInputVoltage.vi
X	X	X		SngJntArmSim_SetState.vi
X	X	X		SngJntArmSim_Update.vi
X	X	X		SngJntArmSim_UpdateX.vi
X	X	X		SngJntArmSim_WouldHitLowerLimit.vi
X	X	X		SngJntArmSim_WouldHitUpperLimit.vi

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

> X X Menu Item
> S S Execution Opt Function Prototype Notes MatBuilder_Create.vi
> MatBuilder_Fill.vi

MATRIX	X mplemented	X X Documented	Not WPILIB	X X Menu Item	인 연 Execution Optimized	Test Routine	VI Name Function Prototype Matrix_AssignBlock.vi Matrix_Block.vi	Notes	Code Review	Test Program	Error Checking
							Matrix_ChangeBoundsUnchecked.vi				
	Χ	X		X	SI		Matrix_Create.vi				
							Matrix_Det.vi				
	Χ	X		X	SI		Matrix_Diag.vi				
							Matrix_Div_Scalar.vi	labview has function			
					01		Matrix_ElementPower.vi				
	Χ	X		Χ	SI		Matrix_ElementSum.vi				
							Matrix_ElementTimes.vi Matrix Equals.vi				
	Χ	X		X	1		Matrix Exp.vi				
	X	\hat{X}		X	SI		Matrix ExtractColumnVector.vi				
	X	X		X	SI		Matrix ExtractFrom.vi				
					0,		Matrix ExtractMatrix.vi				
	Χ	X		X	SI		Matrix ExtractRowVector.vi				
	Χ	X		Х	SI		Matrix_Fill.vi				
							Matrix_Get.vi	labview has function			
	Χ	X		Х	I		Matrix_Ident.vi	WPILIB calls this EYE			
							Matrix_Inv.vi				
	Χ	Χ		Χ	SI		Matrix_IsEqual.vi				
							Matrix_IsIdentical.vi				
	Χ	X		X	1		Matrix_LLTDecompose.vi				
							Matrix_Max.vi				
							Matrix_MaxAbs.vi				
							Matrix_Mean.vi				
							Matrix_MinInternal.vi				
							Matrix_Minus_Matrix.vi				

model follower and time	ıntei	polatable	routin	ies.							
						Matrix_Minus_Scalar.vi					
	Χ	X	X	I		Matrix_NormF.vi					
						Matrix_NormIndP1.vi					
						Matrix_Plus_Matrix.vi					
						Matrix_Plus_Scalar.vi					
	Χ	X	X	1		Matrix Pow.vi		THIS NEEDS WORK!!!!			
	Χ	X	X	SI		Matrix SetColumn.vi		-			
	X	X	X	SI		Matrix_SetRow.vi	THERE ARE LOTS OF OTHER MATRIX FUNCTIONS THAT				
	^	^	^	0,		IMACIA_OCCO.VI	SHOULD BE INCLUDED HERE FOR ISOLATION.				
						Matrix_Solve.vi	OHOGES SE INCEGSES HERE FOR IGOE (HOV.				
						Matrix_Times_Matrix.vi					
						Matrix_Times_Scalar.vi					
			-			Matrix Trace.vi					
		V	- V	01							
		X		SI		Matrix_Transpose.vi					
	Χ	X				Matrix_WithinTolerance.vi					
l											
	Implemented	Documented Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
SIMPLE MATRIX		$X \mid X$	\overline{X}	SI		SimpleMatrix_ExtractMatrix.vi	- undustri retetype	NOTE Matrix also has an			
SIMIT LE MIATRIA	^	^	^	31		OIITIPIEWatrix_Extractiviatrix.vi		ExtractMatrix with different calling			
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MATRIX HELPER	× Implemented	X Documented X Not WPILIB	X Menu Item	ত Execution Optim	Test Routine	words and the state of the stat	Function Prototype	Notes	Code Review	Test Program	Error Checking
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VECTOR BUILDER		X	X	SI		VecBuilder_1x1Fill.vi					
	Χ	X	X	SI		VecBuilder_2x1Fill.vi					
	Χ	Χ	X	SI		VecBuilder_3x1Fill.vi					
	Χ	X	X	SI		VecBuilder_4x1Fill.vi					
	Χ	X	X	SI		VecBuilder_5x1Fill.vi					
	Χ	X	X	SI		VecBuilder_6x1Fill.vi					
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			-			VecBuilder_9x1Fill.vi					
			1			VecBuilder_10x1Fill.vi					
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MATH
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ANGLE STATISTICS X X X X X X X X X	I X AngleStats_AngleAdd.vi X AngleStats_AngleMean_CallbackHelp.vi I X AngleStats_AngleMean.vi	Function Prototype	Notes O		Test Program Froc Checking
MATH UTILITY X X X X X X X X X X X X X X X X X X X	With Display Deads and Display	Function Prototype	Notes OO		Test Program Fror Checking
MERWE SCALED SIGMA POINTS X X X X X X X X X X X X X X X X X X X	/ MerweScSigPts New.vi	Function Prototype	Notes O	F	Test Program Froc Checking
ed ed	St NumIntegrate Rkd Mat X U.vi NumIntegrate Rkdp Func A.vi	71	Notes Not USED. Should this be used or abandoned???		Test Program Fror Checking

FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. XX NumIntegrate_Rkdp_Func_B2.vi No SI XX Numintegrate Rkdp Impl.vi No I XX X NumIntegrate_RKDP_Mat_X_U.vi New replacement for RKF45 X X No SI NumIntegrate_Rkf45_Func_A.vi XX No SI NumIntegrate_Rkf45_Func_B1.vi XX No SI NumIntegrate_Rkf45_Func_B1B2.vi NumIntegrate Rkf45 Func B2.vi $X \mid X$ No SI 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 X NumIntegrate_Rkf45_Mat_X_U.vi Note that this Feinberg method has been changed and a Dormand Price method has been implemented.... TODO NumIntegrate_RKf45_New.vi Removed. Never used. X X X X SI NumIntegrate_Trap_Dbl.vi X X X X I NumIntegrate Trap Mat.vi Test Routine Vot WPILIB Function Prototype Notes RUNGE KUTTA TIME VARYING XNo RungeKuttaTimeVarying RK4 Mat T Y.vi Execution Opti Test Routine Vot WPILIB Function Prototype Notes VI Name NUMERICAL JACOBIAN X X Χ NumJacobian U.vi XX Χ NumJacobian_X.vi

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optin	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
RICCATI	X	X		Χ			Riccati_Check_Detectable.vi		Routine exists, it is just a shell			
	X	X		Χ			Riccati_Check_Stabilizable.vi		Not really done !!!			
	X	X	X	Χ		X	Riccati_DARE_Iterate.vi					
	Χ		Χ			Χ	Riccati_DARE_StructDoubling.vi					
	X	X		Χ			Riccati_DARE_N.vi					
	X	X		Χ		Χ	Riccati_DARE.vi					
	X	X		X			Riccati Input Check.vi					

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

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FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time into	erpola	atable r	outines				_				
Implemented	Documented	Not WPILIB	Menu Item	Lecturor Optimized Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
COMPUTER VISION UTILITIES X	X		X			CompVisionUtil_CalculateDistanceToTarget.vi					
X	X		X			CompVisionUtil_EstimateCameraToTarget.vi					
X	X		X			CompVisionUtil_EstimateFieldToCamera.vi					
X	X		X			CompVisionUtil_EstimateFieldToRobot.vi					
X	X		X			CompVisionUtil_EstimateFieldToRobot_Alt.vi					

	X X X	Comprisionotii_Estimater leid fortobot_Ait.vi				
'========= TVDE DEENUTIONS						
TYPE DEFINITIONS						
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	imi	<i>E</i>				
	Dot 2	26			×	Ĕ
	nte nn C nn C	$\Sigma_{\mathcal{L}}$, vie	g
	Implemented Documented Not WPILIB Menu Item Execution Op	R VI Name			ል ያ	Test Progran
	ple cu. nt V nt V snu	L			Code	st
		δ VI Name	Function Prototype	Notes	ပိ	<u> 1</u> e
	TypeDef Z X X X N/A	ARM_FF.CTL				
	Z X X X N/A	BANG_BANG.CTL				
	\ \ X \ X \ N/A	BICon-Matrix_FUNC_TYPE.CTL		NOT USED. Should this be		
				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				
	Z X X X N/A	DCMOTOR_SIM.CTL				
	Z X X X N/A	DEBOUNCER_TYPE_ENUM.Ctl DEBOUNCER.CTL				
	Z X X X N/A					
	Z X X X N/A	DIFF_DRIVE_KINEMATICS_CTI				
	Z X X X N/A Z X X X N/A	DIFF_DRIVE_KINEMATICS.CTL DIFF_DRIVE_Kitbot_WheelSize_ENUM.ctl				
		DIFF_DRIVE_NIBOL_WITEETSIZE_ENOM.CTI DIFF_DRIVE_POSE_EST.ctl				
		DIFF_DRIVE_POSE_EST.cti DIFF_DRIVE_ToughBoxMini_GearChoice_ENUM.ctl				
		DIFF_DRIVE_ToughBoxMini_MotorChoice_ENUM.ctl				
	Z X X X N/A	DIFF_DRIVE_TOUGHBOXWIIII_WOLOICHOICE_ENOWI.CII DIFF_DRIVE_TRAIN_SIM_STATE_ENUM.CTL				
	Z X X X N/A	DIFF DRIVE TRAIN SIM STATE ENGINEER DIFF DRIVE TRAIN SIM.ctl				
	Z X X X NA	DISPLAY WAYPOINT.ctl		Was UTIL WAYPOINT.VI		
	Z X X X NA	DISPLAY_WEIGHTED_WAYPOINT.ctl		New V1.5. was		
		DISTERT_WEIGHTED_WATTOHIT.CO		UTIL_WEIGHTED_WAYPOINIT.VI		
	Z X X X N/A	ELEV FF.CTL				
	Z X X X N/A	ELEVATOR SIM.CTL				
	Z X X X N/A	EXTENDED KALMAN CORRECT FUNC GROUP.CTL				
	Z	ExTENDED_KALMAN_FILTER.CTL				
	Z X X X N/A	FLYWHEEL_SIM.ctl				
	Z X X X N/A	FUNCTION GENERATOR.ctl				
	Z X X X N/A	HOLONOMIC_DRV_CTRL.CTL		New 1/26/21		
	Z X X X N/A	TIME_INTERPOLATABLE_BOOLEAN.CTL				
	Z X X X N/A	TIME_INTERPOLATABLE_DOUBLE.CTL				
	Z X X X N/A	TIME_INTERPOLATABLE_POSE.CTL				
	Z X X N/A	TIME_INTERPOLATABLE_ROTATION.CTL				
	Z X X X N/A	KALMAN_FILTER_LATENCY_COMP_FUNC_GROUP.CTL				
	Z X X X N/A	KALMAN_FILTER_LATENCY_COMP.CTL				
	Z X X X N/A	KALMAN_FILTER.ctl				
	Z X X N/A	LINEAR_FILTER.CTL				
	Z X X X N/A	LINEAR_PLANT_INV_FF.ctl				
	$Z \mid X \mid X \mid X \mid N/A$	LINEAR_QUADRATIC_REGULATOR.ctl				
		<u> </u>	<u> </u>			

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n <u>e inte</u>	interpolatable routines.								
Z	X	X	X	N/A		LINEAR_SYSTEM_LOOP.ctl			
Z	X	X	X	N/A		LINEAR_SYSTEM_SIM.ctl			
Z	X			N/A		LINEAR SYSTEM.cti			
Ζ		Х		N/A		LTV DIFF DRIVE CTRL.ctl			
Z		Х		N/A		LTV DIFF DRIVE CTRL STATE ENUM.ctl			
Z		X		N/A		LTV UNICYCLE CONTROLLER.CTL			
Z		X		N/A		LTV UNICYCLE CONTROLLER INPUT ENUM.ctl			
Z		X		N/A		LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl			
Z	X	X		N/A		MECA_DRIVE_KINEMATICS.CTL			
Z	X	X	X	N/A		MECA_DRIVE_ODOMETRY.CTL			
Z	X	X	X	N/A		MECA_WHEEL_SPEEDS.CTL			
Z	X	X		N/A		MEDIAN_FILTER.CTL			
Z	X	X	X	N/A		MERWE_SCALED_SIGMA_PTS.ctl			
Z	X	X	X	N/A		OBSERVER SNAP LIST ITEM.CTL			
Z	X	X	Х	N/A		OBSERVER SNAPSHOT.CTL			
Z	X	X		N/A		PARAM STACK ITEM.CTL			
Z	X	X	X	N/A		PARAM STACK.CTL			
Z	X			N/A		PID ADV LIMITS.CTL			
	X	X				PID ADV TUNING.CTL			
Z				N/A		PID_ADV_TONING.CTL PID_CONTROLLER.CTL			
Z	X	X							
Z	X	X		N/A		PID_ERROR_TOLERANCE.CTL			
Z	X	X		N/A		PID_INPUT_LIMITS.CTL			
Z	X	X	X	N/A		PID_TUNING.CTL			
Ζ	X	X	X	N/A		POSE2D.CTL			
Z	X	X	X	N/A		POSEWCURVATURE.CTL			
Z	Χ	X	X	N/A		PROFILED PID CONTROLLER.CTL			
Z	X	X	X	N/A		RAMSETE EXE TUNING.CTL			
Z	X	X		N/A		RAMSETE.CTL			
Z	X	X		N/A		ROTATION2D.CTL			
Z	$\frac{\lambda}{X}$	X		N/A		SIMPLE MOTOR FF.CTL			
		X	X			SINGLE JOINT ARM SIM.CTL			
Z	X			N/A					
Z	X	X		N/A		SLEW_RATE_LIMITER.CTL			
Z	X	X		N/A		SPLINE_CTRL_VECTOR.CTL			
Z	X	X	X	N/A		SPLINE.CTL SPLINE.CTL			
Z	X	X		N/A		SWERVE_DRIVE_KINEMATICS.CTL			
Z	X	X		N/A		SWERVE_DRIVE_MODULE_STATE.CTL			
Z	X	X	X	N/A		SWERVE_DRIVE_ODOMETRY.CTL			
Z	X	X	X	N/A		SWERVE DRIVE POSE EST.CTL			
Z	Χ	X	X	N/A		TIMER.CTL			
Z	X	X	X	N/A		TRAJ CONFIG.CTL			
Z	X	X	X	N/A		TRAJ CONSTRAINT CENTRIPETAL ACCEL.CTL			
Z	X			N/A		TRAJ CONSTRAINT DIIF DRIVE KINEMATICS.CTL			
Z	X			N/A		TRAJ CONSTRAINT DIIF DRIVE VOLTAGE.CTL			
	^	X	_^	N/A		TRAJ_CONSTRAINT_DIIP_DRIVE_VOLTAGE.CTL TRAJ_CONSTRAINT_JERK.CTL	Pouting exists, it is just a shall		
7	V		V				Routine exists, it is just a shell		
Z	X	X				TRAJ_CONSTRAINT_MECA_DRIVE_KINEMATICS.CTL			
Z	X			N/A		TRAJ_CONSTRAINT_MINMAX.CTL			
Z	X			N/A		TRAJ_CONSTRAINT_SWERVE_DRIVE_KINEMATICS.CTL			
Z	X	X	X	N/A		TRAJ_STATE.CTL			
Z	X		X	N/A		TRAJECTORY_SPLINE_TYPE_ENUM.CTL			
Ζ	X	X	X	N/A		TRAJECTORY.CTL			
Z	X	X		N/A		TRANSFORM2D.CTL			
Z	X	X	X	N/A		TRANSLATION2D.CTL			
Z	X		X	N/A		TRAPEZOID PROFILE CONSTRAINT.CTL			
Z	X					TRAPEZOID PROFILE STATE.CTL			
Z	X			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			UNSCENTED_KALMAN_FILTER.ctl			
Z	X			N/A		UNSCENTED_KALMAN_NEW_FUNC_GROUP.CTL			
Z	X		X			UTIL_PATHFINDER_CONFIG.CTL			
N/A		N/A		N/A		WAYPOINTS.CTL CONTROL	Delete – obsolete		
Z				NA		WEIGHTED_WAYPOINT.CTL	New V1.5		
N/A		N/A		N/A		X_Y_HEADINGS.CTL	Delete – obsolete		
Z	Χ	X	X	N/A		X_Y_PAIR.CTL			
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