Revision 3.X 1/11/2023 – renamed library. Added additional documentation.

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...

Doc completed Pct 99.91% Optimization Pct 57.79%

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

'===== BASE

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ANALOG DELAY		X Documented X Not WPILIB	X Menu Item		Test Routine		VI Name AnalogDelay_Execute.vi	Function Prototype	Notes Similar to interpolated tree map	Code Review	Test Program	Error Checking
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Revision 3.X 1/11/2023 – renamed library. Added additional documentation. Routine Function Prototype VI Name Notes LEAD LAG X X X X I LeadLag Execute.vi Routine VI Name Function Prototype Notes LINEAR FILTER X LinearFilter BackwardFiniteDifference.vi X I X X SI X X X X LinearFilter Calculate.vi X XX LinearFilter_CutoffFrequency.vi X X X X I X LinearFilter_Execute.vi Labview style helper AN INTERNAL ROUTINE XX No I LinearFilter Factorial.vi LinearFilter FiniteDifference.vi XX I X X LinearFilter HighPass.vi Χ X X X X X X X X LinearFilter HighPassBW1.vi LinearFilter_HighPassBW2.vi X X X X LinearFilter LowPassBW1.vi LinearFilter LowPassBW2.vi X X X X X X X X LinearFilter_MovingAverage.vi Χ LinearFilter New.vi LinearFilter Reset.vi LinearFilter_ResetToValue.vi XX X LinearFilter SinglePoleIIR.vi LinearFilter TimeConst.vi $X \mid X \mid X \mid X$ VI Name Function Prototype Notes MEDIAN FILTER X MedianFilter Calculate.vi X X X X X X MedianFilter_Execute.vi Labview style helper XX X SI MedianFilter New.vi X SI MedianFilter Reset.vi X X X X SI MedianFilter ResetToValue.vi Function Prototype VI Name Notes SLEW RATE FILTER X X SlewRateLimiter Calculate.vi X XX X SI SlewRateLimiter_Close.vi X X X X I X SlewRateLimiter Execute.vi Labview style helper X X X X SI SlewRateLimiter GetRate.vi XX SlewRateLimiter New.vi Χ XX Χ SlewRateLimiter NewInitialZero.vi X I X SI X X X X SlewRateLimiter Reset.vi Х SlewRateLimiter SetRate.vi

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Revision 3.X 1/11/2023 – renamed library. Added additional documentation.

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PID CONTROLLER	X X Implemented	X X Documented	X X Not WPILIB	X X Menu Item	Execution Optimized	Test Routine		VI Name PIDController_AdvCalculate_FF_Sp_Pv_Per.vi PIDController_AdvCalculate_FF_Sp_Pv.vi PIDController_AdvExecute.vi	Function Prototype	Notes Advanced PID Advanced PID Labview style helper. Advanced	Code Review	Test Program	Error Checking
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		X		X				ProfiledPIDController_GetGoal.vi					
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	Χ			Χ				ProfiledPIDController_GetPositionError.vi					
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	X	X		_ X	SI			SimpleMotorFF_Calculate.vi	public double calculate(double velocity, double acceleration)				

Revision 3.X 1/11/2023 – renamed library. Added additional documentation. SimpleMotorFF_CalculateVelocityOnly.vi public double calculate(double velocity) XX X SI X X X SimpleMotorFF Ka AutoTune.vi SimpleMotorFF MaxAchieveAccel.vi public double maxAchievableAcceleration(double maxVoltage, X X double velocity) Χ Χ Χ SimpleMotorFF MaxAchieveVel.vi public double maxAchievableVelocity(double maxVoltage, double acceleration) Χ Χ SimpleMotorFF_MinAchieveAccel.vi X public double minAchievableAcceleration(double maxVoltage, double velocity) X X SimpleMotorFF MinAchieveVel.vi public double minAchievableVelocity(double maxVoltage, double acceleration) SimpleMotorFF New.vi X SI public SimpleMotorFeedforward(double ks, double kv, double ka) X X X X X SI SimpleMotorFF Pack Ka Tune Params.vi public SimpleMotorFeedforward(double ks, double kv) '======== GEOMETRY '======== ζo VI Name Function Prototype Notes COORDINATE AXIS Χ SI CoordAxis D.vi Χ Χ SI CoordAxis E.vi XX X SI CoordAxis N.vi CoordAxis_New.vi $X \mid X$ X SI XX X SI CoordAxis S.vi Χ Χ X SI CoordAxis U.vi X SI Χ CoordAxis W.vi Execution VI Name Function Prototype **COORDINATE SYSTEM** CoordSystem Convert Pose3d.vi X Χ SI X Χ Χ SI CoordSystem Convert Rotation3d.vi XX X SI CoordSystem Convert Translation3d.vi XX X SI CoordSystem_Convert_Transform3d.vi X X CoordSystem_EDN.vi X SI X Χ SI X CoordSystem NED.vi Х Χ X SI X CoordSystem New.vi XX X SI X CoordSystem NWU.vi Execution Function Prototype Notes POSE2D Χ SI Pose2d Div.VI Χ XX X SI Pose2d Equals.VI boolean equals(other obj) XX XX Pose2d Exp.vi pose2d exp(twist2d twist) XX 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 XX X SI Pose2d getXY.vi X X X X SI Pose2d getXYAngle.vi X X X X X I Pose2d Interpolate.vi Pose2d_Log.vi XX twist2d log(pose2d end) X X Pose2d Minus.vi transform2d minus(pose2d other) X SI Χ SI Pose2d New TRRO.vi pose2d new(translation2d, rotation2d) XX X SI Pose2d_New.vi pose2d new(double x, double y, rotation2d) pose2d plus(transform2d other) XX X SI Pose2d Plus.vi Х Pose2d_RelativeTo.vi XX X SI pose2d relativeto(pose2d other) XX Pose2d Times.vi SI

WPILib LabVIEW Math Library - VI Implementation List Revision 3.X 1/11/2023 – renamed library. Added additional documentation. Pose2d TransformBy.vi pose2d transformby(transform2d other) X SI pose2d new() can use cluster constant VI Name Function Prototype Notes POSE3D X SI Pose3d Div.vi X X SI $X \mid X$ Pose3d_Equals.VI XX Χ Pose3d_Exp.vi X X X SI X SI Pose3d getRotation.vi Pose3d_getTranslation.vi X X X X SI Pose3d getXYZ.vi XX X I Pose3d Interpolate.vi XX Pose3d_Log.vi XX X X X SI X SI Pose3d Minus.vi Pose3d_New.vi XX X SI Pose3d New Default.vi XX SI Pose3d New Pose2d.vi Pose3d New Trans3dRot3d.vi XX X SI X X X X X X SI Pose3d Plus.vi Χ X SI Pose3d RelativeTo.vi Pose3d RotationVectorToMatrix.vi No SI XX X SI Pose3d ToPose2d.vi XX SI Pose3d Times.vi Pose3d TransformBy.vi XX X SI Routine Execution Op VI Name Function Prototype Notes Quaternion_Equals.vi QUATERNION Χ SI Χ Χ X SI X SI X X Quaternion Get All.vi Quaternion Get LVQuat.vi XX X SI Quaternion Get Vect.vi XX X SI Quaternion Get W.vi Quaternion_Inverse.vi XX X SI X X SI Quaternion New.vi X X Quaternion_New_Default.vi SI XX X SI Quaternion New LVQuat.vi XX X SI Quaternion Normalize.vi X SI Quaternion Plus.vi $X \mid X$ X X X SI Quaternion_Times.vi XX X SI Quaternion ToRotationVector.vi VI Name Function Prototype Notes ROTATION2D X X X X X X SI X SI Rotation2d CreateAngle.vi rotation2d new(double value) Rotation2d_CreateAngleDegrees.vi rotation2d fromDegrees(double degrees) convert to radians then create XX X SI Rotation2d CreateAngleRotations.vi Rotation2d CreateXY.vi XX X SI rotation2d new(double x, double y) XX Rotation2d Div.vi SI X SI X SI X Χ Rotation2d Equals.vi boolean equals(rotation2d other) Х

double getCos()

double getDegrees()

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X Χ Rotation2d GetAngleCosSin.vi

Rotation2d GetCos.VI

Rotation2d GetDegrees.VI

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New 1/26/21

degree

use cluster unpack

use cluster unpack, then convert to

WPILib LabVIEW Math Library - VI Implementation List Revision 3.X 1/11/2023 – renamed library. Added additional documentation. X SI Rotation2d GetRadians.VI double getRadians() use cluster unpack XX X SI Rotation2d GetRotations.vi X SI X X X X Rotation2d GetSin.VI double getSin() use cluster unpack X SI Rotation2d GetTan.VI double getTan() can calculate Χ X SI Rotation2d_Interpolate.vi X XX X SI Rotation2d Minus vi rotation2d minus(rotation2d other) XX X SI Rotation2d Plus.vi rotation2d plus(rotation2d other) Rotation2d_RotateBy.vi rotation2d rotateby(rotation2d other) $X \mid X$ X SI Χ Rotation2d_Times.vi Χ X SI rotation2d times(double scalar) XX X SI Rotation2d UnaryMinus.vi rotation2d unaryminus() rotation2d new() can use cluster constant VI Name Function Prototype Notes ROTATION3D X X X SI Rotation3d Create AxisAngle.vi XX X SI Rotation3d Create Default.vi Rotation3d Create Quaternion.vi $X \mid X$ X SI X X X X X X Rotation3d Create InitialFinalVector.vi Χ 1 Χ SI Rotation3d Create RollPitchYaw.vi Rotation3d Create RotMatrix.vi X I XX SI Rotation3d Div.vi XX X SI Rotation3d Equals.vi X X X X SI Rotation3d_GetAxisAngle.vi X SI Rotation3d GetQuaternion.vi X XX X SI Rotation3d GetXYZ.vi XX X SI Rotation3d Interpolate.vi XX X SI Rotation3d Minus.vi X X X X X SI Rotation3d Plus.vi X SI Rotation3d RotateBy.vi X X X X X SI Rotation3d Times.vi X SI Rotation3d ToRotation2d.vi XX X SI Rotation3d UnaryMinus.vi Check Execution Function Prototype Notes TRANSFORM2D X | X | X SI Transform2d Create PosePose.vi transform2d new(pose2d, pose2d) transform2d new(translation2d, rotation2d) X SI Transform2d Create TransRot.vi $X \mid X$ X X SI Transform2d_Div.vi X SI Transform2d Equals.VI boolean equals(other transform2d) X X SI Transform2d GetRotation.VI rotation2d getRotation() use cluster unpack use cluster unpack XX X SI Transform2d GetTranslation.VI translation2d getTranslation() X X X X SI Transform2d GetXY.vi Transform2d_GetXYAngle.vi X X X X SI X SI Transform2d Inverse.vi $X \mid X \mid$ transform inverse() new X X Si Transform2d Plus.vi XX X SI Transform2d Times.vi transform2d times(double scalar) transform2d new() can use cluster constant

VI Name

Transform3d Create Default.vi

Transform3d Create Pose3dPose.3dvi Transform3d Create Trans3dRot3d.vi

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Function Prototype

Notes

TRANSFORM3D

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X SI	Transform3d_Div.vi Transform3d_Equals.VI Transform3d_GetRotation3d.VI Transform3d_GetXYZ.vi Transform3d_Inverse.vi Transform3d_Plus.vi Transform3d_Times.vi Transform3d_Times.vi ### Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi Translation2d_Equals.vi Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetX.VI Translation2d_GetX.VI Translation2d_GetX.VI Translation2d_GetY.VI Translation2d_GetY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi Translation2d_Plus.vi Translation2d_Plus.vi Translation2d_Plus.vi Translation2d_Plus.vi Translation2d_RotateBy.vi	Function Prototype translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() double getY() translation2d minus(translation2d other)	Notes can use cluster unpack can use cluster unpack can use cluster unpack	Code Review	Test Program	Error Checking
X S X	Transform3d_Equals.VI Transform3d_GetRotation3d.VI Transform3d_GetXYZ.vi Transform3d_Inverse.vi Transform3d_Plus.vi Transform3d_Times.vi VI Name Translation2d_Create_DistAng.vi Translation2d_Div.vi Translation2d_Div.vi Translation2d_Equals.vi Translation2d_GetAngle.vi Translation2d_GetNgle.vi Translation2d_GetNyl Translation2d_GetXVI Translation2d_GetXY.VI Translation2d_GetXY.VI Translation2d_GetY.VI Translation2d_GetY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi Translation2d_Interpolate.vi Translation2d_Interpolate.vi Translation2d_Minus.vi Translation2d_Plus.vi	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() double getY()	can use cluster unpack	Code Review	Test Program	Error Checking
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Revision 3.X 1/11/2023 – renamed library. Added additional documentation. Notes Function Prototype VI Name TWIST3D X SI X Twist3d Create.vi X SI Twist3d Equals.VI X X X SI X Twist3d GetAll.VI '======= KINEMATICS '======= Function Prototype Notes CHASSIS SPEEDS X ChassisSpeeds_FromFieldRelativeChassisSpeeds.VI SI SI ChassisSpeeds_FromFieldRelativeSpeeds.VI chassisspeeds fromFieldRelativeSpeeds(double x, double y, double angvel, rotation2d robotangle) ChassisSPeeds_GetXYOmega.vi X X X X SI 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) Χ $X \mid I \mid X$ DiffKinematics toChassisSpeed.vi chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds) X SI X DiffKinematics toWheelSpeed.vi diffDriveWheelSpeed toWheelSpeeds(chassisSpeeds) Function Prototype VI Name Notes DIFFERENTIAL DRIVE ODOMETRY DiffOdometry_Execute.vi DONT NEED DiffOdometry_Update.vi pose2d update(rotation2d gyro, double leftdist, double right dist) Incorporates enhanced reset diffDrOdom new(rotation gyro, pose initial) diffDrOdom new(rotation gyro) void resetPosition(pose2d, rotation2d) incorporated into "update" pose2d getPoseMeters() Function Prototype Notes DIFFERENTIAL DRIVE WHEEL SPEEDS diffDrWheelSpeeds new() diffDrWheelSpeeds new(double leftVel, double rightVel) X X Χ DiffWheel Normalize.vi void normalize(double maxVel)

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MECANUM DRIVE KINEMATIC	S X	$\frac{X}{V}$		X	X		MecaKinematics_New.vi MecaKinematics_SetInverseKinematics.vi					+
	$\frac{\lambda}{X}$	X			X		MecaKinematics_Settiverserkinematics.vi MecaKinematics_ToChassisSpeeds.vi					+
	X	X		X			MecaKinematics_ToTwist2d.vi					
	X				X		MecaKinematics_ToWheelSpeeds.vi					
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MECANUM DRIVE MOTOR VOLTAG	othing do											
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized Test Routine		VI Name	Function Prototype	Notes	Code Review	Test Program	
MECANUM DRIVE ODOMETR		<u> </u>	X	V/	\ <u></u>		MecaOdometry_Execute.vi					+-
	X	X	Χ	X	X		MecaOdometry_GetKinematics.vi MecaOdometry_GetPose.vi					+
	X	X		X			MecaOdometry_New.vi					+
	X	X		Χ			MecaOdometry_NewDefaultPose.vi					
	X	X		X			MecaOdometry_Reset.VI MecaOdometry_Update.vi					+
	^						MecaOdometry_UpdateWithTime.vi		Removed			+
				X Menu Item	2 G Execution Optimized Test Routine	Sample P	VI Name MecaWheelPos_Get.vi	Function Prototype	Notes	Code Review	Test Program	:
MECANUM DRIVE WHEEL POSITIO		X			SI		MecaWheelPos_New.vi MecaWheelPos_Sub.vi					+
MECANUM DRIVE WHEEL POSITIO	X	Y	.	X								+
MECANUM DRIVE WHEEL POSITIO	X	X		X	SI							
		X Documented	Not WPILIB	Menu Item		Sample Program	VI Name	Function Prototype public MecanumDriveWheelSpeeds(double	Notes	Code Review	Test Program	
MECANUM DRIVE WHEEL POSITIO	X Implemented	X Documented	Not WPILIB	X Menu Item	So Execution Optimized So Test Routine	Sample Program	VI Name MecaWheel_New.Vi	Function Prototype public MecanumDriveWheelSpeeds(double frontLeftMetersPerSecond, double frontRightMetersPerSecond, double rearLeftMetersPerSecond, double rearRightMetersPerSecond)	Notes	Code Review	Test Program	
	X Implemented	X Documented	Not WPILIB	X Menu Item	So Execution Optimized So Test Routine	Sample Program	VI Name	public MecanumDriveWheelSpeeds(double frontLeftMetersPerSecond, double frontRightMetersPerSecond, double rearLeftMetersPerSecond, double	Notes	Code Review	Test Program	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimizea	Test Routine	Sample Program	Function Prototyna	Notes	Code Review	Test Program	rror Checking
SWERVE DRIVE KINEMATICS				_ <u>X</u>	_Ш_	<u> </u>	ශී VI Name SwerveKinematics New4.VI	Function Prototype	Notes For 4 module drives	<u> </u>	<u> </u>	<u> </u>
				X	\vdash	\vdash	SwerveKinematics_New4.VI		uses array as input			
	\hat{x}	\hat{x}	X	X	+	$\overline{}$	SwerveKinematics_NormalizeWheelSpeeds.vi	public static void normalizeWheelSpeeds(SwerveModuleState[]	uses array as iriput			
	^	^	^	^	['	1 1	ower vertinematics_informatizev/freetopeeds.vi	moduleStates, double attainableMaxSpeedMetersPerSecond)				
	Χ	X	X	X			SwerveKinematics_ToChassisSpeeds4.VI	,	For 4 module drives			
	X	X	X	Χ			SwerveKinematics_ToChassisSpeedsX.VI		uses array as input			
	X	X		X			SwerveKinematics_ToSwerveModuleStates.VI	<pre>public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds, Translation2d centerOfRotationMeters)</pre>				
	X	Χ		Χ			SwerveKinematics_ToSwerveModuleStatesZeroCenter.VI	public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds)				
	X	Y	\rightarrow	X	\vdash	$\overline{}$	SwerveKinematics ToTwist2d4.VI	toowervervioduleotates(Criassisopeeds Criassisopeeds)				
	\hat{X}	$\frac{x}{X}$	\rightarrow	X	\Box	$\overline{}$	SwerveKinematics_ToTwist2dX.VI					
								public SwerveDriveKinematics(Translation2d wheelsMeters)	variable parameters (replace with array and "4" calls)			
								public ChassisSpeeds toChassisSpeeds(SwerveModuleState wheelStates)	variable parameters (replace with array and "4" calls)			
	mplemented	Documented	Not WPILIB	Menu Item	Execution Optim	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	irror Checking
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SWERVE DRIVE ODOWETRY	_	\rightarrow	-	\longrightarrow		\vdash	SwerveOdometry ExecuteX.vi					
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		$\frac{x}{x}$	\rightarrow	X	\Box	\Box	SwerveOdometry_New.VI	public SwerveDriveOdometry(SwerveDriveKinematics kinematics	3.			
-		X		X			SwerveOdometry_NewZeroCenter.VI	Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics				
	X	$\overline{\mathbf{v}}$	\longrightarrow	X	\vdash	\vdash	SwerveOdometry_ResetPosition.VI	Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)				
	X	$\frac{\hat{x}}{x}$	\overline{x}	X	\vdash	\Box	SwerveOdometry_Update4.VI	public void resett osition(r oseza pose, retationza gyroAngie)	For 4 module drives			
					\vdash	\Box	SwerveOdometry UpdateWithTime4.VI		REMOVED			
							SwerveOdometry_UpdateWithTimeX.VI		REMOVED			
	X	X	X	X			SwerveOdometry_UpdateX.VI		uses array as input			
								public Pose2d updateWithTime(double currentTimeSeconds,	variable parameters (replace with			
								Rotation2d gyroAngle, SwerveModuleState moduleStates)	array and "4" calls)			
								public Pose2d update(Rotation2d gyroAngle, SwerveModuleState moduleStates)	variable parameters (replace with array and "4" calls)			
	lemented	Documented	WPILIB	nu Item	ecution Optimized	Test Routine	Sample Program			de Review	t Program	or Checking
	шĘ	ρŏ	Not	Menu	Exe	7es	S VI Name	Function Prototype	Notes	Ö	Tes	Ξrrc
DRIVE MODULE POSITIONS		\overline{X}		Χ	SI		SwerveModulePosition_CompareTo.vi					
	X	X		Χ	SI		SwerveModulePosition_Get.vi					
	Χ	Χ		Χ	SI		SwerveModulePosition_New.vi					
L					timized		gram			Me	<u>E</u>	
	ented	ented	BITIc	tem	ion Op	outine	Prog			?evie	ogra	heck
	lemented	umented	WPILIB	u Item	cution Op	: Routine	iple Prog			e Revie	: Progra	r Check
	mplemented	ocumented	lot WPILIB	lenu Item	xecution Op	est Routine	on VI Name	Function Prototype	Notes	ode Revie	est Progra	irror Check
RVF DRIVE MODIJI E STATE	× Implemented	× Documented	Not WPILIB	× Menu Item	2 Execution Op	Test Routine	SwerveModuleState CompareTo vi	Function Prototype	Notes	Code Revie	Test Progra	Error Check
RVE DRIVE MODULE STATE			Not WPILIB	X X Menu Item	SI	Test Routine	VI Name SwerveModuleState_CompareTo.vi SwerveModuleState Get.vi	Function Prototype public int compareTo(SwerveModuleState o)	Notes	Code Revie	Test Progra	Error Check

Revision 3.X 1/11/2023 – renamed library. Added additional documentation. SwerveModuleState Optimize.vi public SwerveModuleState optimize(SwerveModuleState desired, X X SI Χ Rotation2d angle) '======== SPLINE '========= Function Prototype VI Name Notes **CUBIC HERMITE SPLINE** protected SimpleMatrix getCoefficients() not needed, use cluster unpack private SimpleMatrix getControlVectorFromArrays(double[] CubicHermiteSpline getControlVectorFromArrays.vi initialVector, double[] finalVector)
private SimpleMatrix makeHermiteBasis() CubicHermiteSpline_makeHermiteBasis.vi Χ X public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] Χ X Χ CubicHermiteSpline New.vi yFinalControlVector) Che VI Name Function Prototype Notes POSE WITH CURVATURE X PoseWithCurve New.vi public PoseWithCurvature(Pose2d poseMeters, double SI curvatureRadPerMeter) public PoseWithCurvature() can use cluster constant public Pose2d poseMeters not needed, use cluster unpack public double curvatureRadPerMeter. not needed, use cluster unpack WPILIB Function Prototype Notes QUINTIC HERMITE SPLINE X QuinticHermiteSpline_getControlVectorFromArrays.vi private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) QuinticHermiteSpline makeHermiteBasis.vi private SimpleMatrix makeHermiteBasis() public QuinticHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, X X Χ QuinticHermiteSpline New.vi double[] yFinalControlVector) protected SimpleMatrix getCoefficients() not needed, use cluster unpack Function Prototype Notes VI Name SPLINE (Abstract class) X Spline_getPoint.vi public PoseWithCurvature getPoint(double t) Spline(int degree) public static class ControlVector implemented as data structure public ControlVector(double[] x, double[] y) Routine Function Prototype VI Name Notes private static Spline.ControlVector getCubicControlVector(double SPLINE HELPER X SI SplineHelp GetCubicCtrlVector.vi

scalar, Pose2d point)

ILib LabVIEW Math Library – VI Implementation L												
sion 3.X 1/11/2023 – renamed library. Added additional		entatic						<u>—</u>				
171 172020 — Terramed library. Added additional	X	X		X		X	SplineHelp_GetCubicCtrlVectorsFromWayPts.vi	public static Spline.ControlVector[] getCubicControlVectorsFromWaypoints(Pose2d start, Translation2d[] interiorWaypoints, Pose2d end)				
			X				SplineHelp_GetCubicCtrlVectorsFromWeightedWayPts.vi	,				
			Χ				SplineHelp_GetCubicSpline_Calc1.vi		internal			
		X					SplineHelp_GetCubicSpline_Calc2.vi		internal			
		X	X				SplineHelp_GetCubicSpline_Calc3.vi		internal			
	X	X	_	X	SI	X	SplineHelp_getCubicSplinesFromControlVectors.vi SplineHelp_GetQuinticCtrlVector.vi	public static CubicHermiteSpline[] getCubicSplinesFromControlVectors(Spline.ControlVector start, Translation2d[] waypoints, Spline.ControlVector end) private static Spline.ControlVector getQuinticControlVector(double scalar, Pose2d point)				
							SplineHelp_GetQuinticCtrlVectorsFromWayPts.vi	<pre>public static List<spline.controlvector> getQuinticControlVectorsFromWaypoints(List<pose2d> waypoints)</pose2d></spline.controlvector></pre>	REMOVED 2762			
		4	4				SplineHelp_GetQuinticCtrlVectorsFromWeightedWayPts.vi		REMOVED 2762			
	X			X			SplineHelp_getQuinticSplinesFromControlVectors.vi	public static QuinticHermiteSpline[] getQuinticSplinesFromControlVectors(Spline.ControlVector[] controlVectors)				
			X				SplineHelp_GetQuinticSplinesFromWeightedWayPts.vi		New 2762			
	X		+	X			SplineHelp_GetQuinticSplinesFromWayPts.vi	with the station and the war Algorithm (Asset) - Asset - D	New 2762			
	X	X		No			SplineHelp_ThomasAlgorithm.vi	private static void thomasAlgorithm(double[] a, double[] b, double[] c, double[] d, double[] solutionVector)	ınternai			
SPLINE PARAMETERIZEI	R	X Documented	Not WPILIB	X Menu Item	Execution Op	Test Routine	VI Name SplineParam_Spline_T0_T1.vi	Function Prototype public static List <posewithcurvature> parameterize(Spline spline, double t0, double t1)</posewithcurvature>	Notes	Code Revi	Test Progr	Error Chec
	X	X	+-	X		X	SplineParam_Spline.vi	public static List <posewithcurvature> parameterize(Spline spline)</posewithcurvature>				
			↓									
			X				SplineParam_StackGet.vi		internal			
			X				SplineParam_StackPop.vi		internal			
	X	<u> </u>	X	INO			SplineParam_StackPush.vi		internal			
ECTORY												
	Implemented	Documented	WPILIB	nu Item	cution Optimized	st Routine	nple Program			de Review	st Program	or Checking
			Not	Menu	Exe	Test	S VI Name	Function Prototype	Notes	Š	7e	Err
TRAJECTOR		X		X			Trajectory_Concatenate.vi					
		X		Χ			Trajectory_equals.vi		FUTURE			
		X	+	X			Trajectory_GetStates.vi	public List <state> getStates()</state>	not needed, use unpack			
	X	X		Х	SI		Trajectory_GetTotalTime.vi		not needed, use unpack			-
				1 A / -			Trajectory_lerp_double.vi	private static double lerp(double startValue, double endValue,	linternal			1
	X	X		No				double t)				
	X	X		No	SI		Trajectory_lerp_Pose.vi	double t) private static Pose2d lerp(Pose2d startValue, Pose2d endValue, double t)	internal			
	X	X		No X	SI SI		Trajectory_lerp_Pose.vi Trajectory_New_Empty.vi	private static Pose2d lerp(Pose2d startValue, Pose2d endValue, double t)				
	X X X	X X X		No X	SI SI		Trajectory_lerp_Pose.vi Trajectory_New_Empty.vi Trajectory_New.vi	private static Pose2d lerp(Pose2d startValue, Pose2d endValue, double t) public Trajectory(final List <state> states)</state>				
	X X X X	X X X X		No X X X	SI SI		Trajectory_lerp_Pose.vi Trajectory_New_Empty.vi Trajectory_New.vi Trajectory_RelativeTo.vi	private static Pose2d lerp(Pose2d startValue, Pose2d endValue, double t) public Trajectory(final List <state> states) public Trajectory relativeTo(Pose2d pose)</state>				
	X X X X X	X X X		No X X X X X	SI SI		Trajectory_lerp_Pose.vi Trajectory_New_Empty.vi Trajectory_New.vi	private static Pose2d lerp(Pose2d startValue, Pose2d endValue, double t) public Trajectory(final List <state> states) public Trajectory relativeTo(Pose2d pose) public State sample(double timeSeconds)</state>				

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public Trajectory transformBy(Transform2d transform)
public Pose2d getInitialPose()

can use cluster unpack, array index

sample.

Trajectory_TransformBy.vi

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X X

	Implemented	Documented		NOT WYPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program				ode Review	est Program	ror Checking
DA IECTODY STATE							<u> </u>		VI Name	Function Prototype	Notes	8	7e	<u> </u>
RAJECTORY_STATE	X	X		x	X	SI SI			TrajectoryState_Equals.vi TrajectoryState GetAll.vi	boolean equals(other obj)				
	X	X		`	X	SI			TrajectoryState GetPose.vi					
	X	X			X	O/			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()				
	Implemented	Documented			Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
RAJECTORY CONFIG	X	X			Χ				TrajectoryConfig_AddConstraint.vi	public TrajectoryConfig addConstraint(TrajectoryConstraint	Implemented differently, can't			
	X	X	+		X				TrajectoryConfig_AddConstraints.vi	constraint) public TrajectoryConfig addConstraints(List extends</td <td>duplicate. Implemented differently, can't</td> <td></td> <td></td> <td></td>	duplicate. Implemented differently, can't			
										TrajectoryConstraint> constraints)	duplicate.			
	X	X			X	SI			TrajectoryConfig_Create.vi	public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq)				
	X	X			X				TrajectoryConfig_GetCentripetalAccel.vi TrajectoryConfig_GetConstraints.vi	public List <trajectoryconstraint> getConstraints()</trajectoryconstraint>	Implemented differently, can't			
											duplicate.			
	Χ	X		_	Χ				TrajectoryConfig_GetEndVelocity.vi	public double getEndVelocity()	can use cluster unpack			
	X	X			Χ				TrajectoryConfig_GetKinematicsDiffDrive.vi					
	X	X			X				TrajectoryConfig_GetKinematicsMecanumfDrive.vi					
	X	X			X				TrajectoryConfig_GetKinematicsSwerveDrive.vi TrajectoryConfig_GetMaxVelAccel.vi			-		
	X	X			X				TrajectoryConfig_GetMaxVelAccel.vi TrajectoryConfig_GetStartVelocity.vi	public double getStartVelocity()	can use cluster unpack			
	X	\hat{x}			\hat{X}				TrajectoryConfig_GetVoltageDiffDrive.vi	pasilo doublo goloiari volocity()	can doc oldotor unpack			
	X	X			Χ				TrajectoryConfig_IsReversed.vi	public boolean isReversed()	can use cluster unpack			
	Χ	X			Χ	SI			TrajectoryConfig_setCentripetalAccel.vi		·			
	X	X			X				TrajectoryConfig_SetEndVelocity.vi	public TrajectoryConfig setEndVelocity(double endVelocityMetersPerSecond)				
	Χ	X			X	SI			TrajectoryConfig_setKinematicsDiffDrive.vi	public TrajectoryConfig setKinematics(DifferentialDriveKinematics kinematics)				
	X	X			X	SI			TrajectoryConfig_setKinematicsMecanumfDrive.vi	public TrajectoryConfig setKinematics(MecanumDriveKinematics kinematics)				
	X	X			X	SI			TrajectoryConfig_setKinematicsSwerveDrive.vi	public TrajectoryConfig setKinematics(SwerveDriveKinematics kinematics)				
	X	X	\top		Χ	SI			TrajectoryConfig_setReversed.vi	public TrajectoryConfig setReversed(boolean reversed)				
	X	X			Χ				TrajectoryConfig_SetStartVelocity.vi	public TrajectoryConfig setStartVelocity(double				
	X	X	+,	X	X	SI			TrajectoryConfig_setVoltageDiffDrive.vi	startVelocityMetersPerSecond)				
	^	_^	+	`	^	31			rrajectoryCornig_setvoltageDIIIDHve.vi	public double getMaxVelocity()	Created function to return both			
								1		public double getMaxAcceleration()	Created function to return both			
			-							NOTE ADD OTHER "SET" ROUTINES FOR OTHER CONTRAINTS HERE, SINCE NEW CONTRAINTS ARE SPECIFIC AND NOT GENERIC.				
	Implemented	Documented	9 10 10	NOT WITTIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
ECTORY GENERATE	X	X			Χ				TrajectoryGenerate_Make_Cubic_CtrlVect.vi	public static Trajectory generateTrajectory(Spline.ControlVector initial, List <translation2d> interiorWaypoints, Spline.ControlVecto end, TrajectoryConfig config)</translation2d>	uses cubic splines r			

	X	X		X	1		1	rajectoryGenerate_Make_Cubic.vi	public static Trajectory generateTrajectory(Pose2d start,	uses cubic splines			
		.							List <translation2d> interiorWaypoints, Pose2d end, TrajectoryConfig config)</translation2d>				
	Х	Х	X	X	\rightarrow		1	rajectoryGenerate Make Generic.vi	Helper to bring these all together	Use this one!!!			
	Χ	Χ		X				rajectoryGenerate_Make_Quintic_CtrlVect.vi	public static Trajectory generateTrajectory(ControlVectorList controlVectors, TrajectoryConfig config)	uses quintic splines			
	· · ·			- V	\rightarrow				controlVectors, TrajectoryConfig config)	N 0700			
	X	X	<u> </u>	X	\rightarrow			rajectoryGenerate_Make_Quintic_Weighted.vi rajectoryGenerate_Make_Quintic.vi	public static Trajectory generateTrajectory(List <pose2d></pose2d>	New 2762 uses quintic splines			
									waypoints, TrajectoryConfig config)	uses quirtic spiries			
	X	X		X				rajectoryGenerate_splinePointsFromSplines.vi	public static List <posewithcurvature> splinePointsFromSplines(Spline[] splines)</posewithcurvature>				
					mized		E						
	lemented	cumented	Vot WPILIB	nu Item	=xecution Optir	t Routine	nple Progra				de Review	t Program	or Checking
	Jul	Doc	Not	Menu	Exe	Test	Sar /	I Name	Function Prototype	Notes	Ö	7es	Erra
TRAJECTORY GENERATE (Control Vector)									public ControlVectorList(int initialCapacity)	may not need, just data			
									public ControlVectorList()	may not need, just data			
									public ControlVectorList(Collection extends<br Spline.ControlVector> collection)	may not need, just data			
	mplemented	Documented	Vot WPILIB	Menu Item	Execution Optin	S	Sample Progran	I Name	Function Prototype	Notes	Sode Review	est Program	error Checking
TRAJECTORY PARAMETERIZE	\overline{x}	X			Ч			rajectoryParam_calcStuffFwd.vi	T unclion i Tototype	Notes			Ш
	X				$\overline{}$			rajectoryParam_calcStuffRev.vi					
	X	X		No			1	rajectoryParam_enforceAccel.vi	private static void enforceAccelerationLimits(boolean reverse,	This routines needs to be changed			
	Χ	X	Χ	No			1	rajectoryParam_enforceVelocity.vi	List <trajectoryconstraint> constraints, ConstrainedState state)</trajectoryconstraint>	when new constraints are added. This routines needs to be changed			
	X	X		X			1	rajectoryParam_timeParam.vi	public static Trajectory timeParameterizeTrajectory(List <posewithcurvature> points. List<trajectoryconstraint> constraints, double startVelocityMetersPerSecond, double endVelocityMetersPerSecond, double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq, boolean reversed)</trajectoryconstraint></posewithcurvature>	when new constraints are added.			
									, , , , , , , , , , , , , , , , , , , ,				
	plemented	cumented	t WPILIB	enu Item	· ·	st Routine	mple Program				de Review	st Program	ror Checking
	Implemented	Documented	Not WPILIB	Menu	Optimiz	st		I Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
ECTORY PARAMETERIZE CONSTRAINED STATE	X Implemented	X Documented		X Menu Item	cution Optimiz	st		I Name onstrainedState_New.vi	ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double	Notes	Code Review	Test Program	Error Checking
ECTORY PARAMETERIZE CONSTRAINED STATE	X	X	Not	X Wenn	cution Optimiz	st	C	onstrainedState_New.vi onstrainedState_SetMaxAccel.vi	ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double	Notes	Code Review	Test Program	Error Checking
ECTORY PARAMETERIZE CONSTRAINED STATE	X	X	X X	X Wenr	cution Optimiz	st	(onstrainedState_New.vi onstrainedState_SetMaxAccel.vi onstrainedState_SetMinAccel.vi	ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double	Notes	Code Review	Test Program	Error Checking
ECTORY PARAMETERIZE CONSTRAINED STATE	X X X	X X X	X X X	X Wen	cution Optimiz	st	(onstrainedState_New.vi onstrainedState_SetMaxAccel.vi onstrainedState_SetMinAccel.vi onstrainedState_SetVelAccel.vi	ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double	Notes	Code Review	Test Program	Error Checking
ECTORY PARAMETERIZE CONSTRAINED STATE	X	X X X	X X X	X Wen	cution Optimiz	st	(onstrainedState_New.vi onstrainedState_SetMaxAccel.vi onstrainedState_SetMinAccel.vi	ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double maxAccelerationMetersPerSecondSq)	Notes	Code Review	Test Program	Error Checking
ECTORY PARAMETERIZE CONSTRAINED STATE	X X X	X X X	X X X	X Wen	cution Optimiz	st	(onstrainedState_New.vi onstrainedState_SetMaxAccel.vi onstrainedState_SetMinAccel.vi onstrainedState_SetVelAccel.vi	ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double	Notes	Code Review	Test Program	Error Checking
ECTORY PARAMETERIZE CONSTRAINED STATE	X X X	X X X	WPILIB X X X X X	ttem X X X X X X X X X X X X X X X X X X X	cution Optimiz	st Routine Test	mple Program	onstrainedState_New.vi onstrainedState_SetMaxAccel.vi onstrainedState_SetMinAccel.vi onstrainedState_SetVelAccel.vi onstrainedState_SetVelAccel.vi	ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double maxAccelerationMetersPerSecondSq) ConstrainedState()		ode Review	est Program Test Program	rror Checking Error Checking
ECTORY PARAMETERIZE CONSTRAINED STATE	Implemented X X X	No Commented	X X X X	X X X X X X	n Optimized Execution Optimiz	st Routine Test	Sample Program	onstrainedState_New.vi onstrainedState_SetMaxAccel.vi onstrainedState_SetMinAccel.vi onstrainedState_SetVelAccel.vi	ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double maxAccelerationMetersPerSecondSq)	Notes	Code Review	Test Program	Error Checking

Revision 3.X 1/11/2023 – renamed library. Added additional de								
		$X \mid X$	X	X	TrajectoryUtil_MakeWeightedWayPoint.vi			
	X	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)		
	Implemented	Documented Not WPILIB	Menu Item	Execution Optimized Test Routine	Sample Program	Function Prototype	Notes	
TRAPEZOID PROFILE		X	X		TrapProfConstraint_New.vi			
		X	X		TrapProfile_Calculate.vi			
		X	No		TrapProfile_Direct.vi		Private, remove from menu	
	X	XX			TrapProfile_Execute.vi			
	X	XX	X	SI	TrapProfile Execute AtGoal.vi			
		X	X		TrapProfile IsFinished.vi			
		X	X		TrapProfile New DefInitial.vi			
		X	X		TrapProfile New.vi			
		X	No		TrapProfile ShouldFlipAcceleration.vi		Private, remove from menu	
		\hat{X}	X		TrapProfile TimeLeftUntil.vi		i iivate, ieiiiove iioiii iiieiiu	
		X	X		TrapProfile_TotalTime.vi			
		X	X		TrapProfState_Equals.vi			
	X	Χ	X		TrapProfState_New.vi			
'=========								
TRAJECTORY CONSTRAINT								
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	Implemente	Documente Not WPILIB	Menu	Execution Op Test Routine	ରୁ ଆଧାର ଓ	Function Prototype	Notes	
CENTRIPETAL ACCELERATION CONSTRAINT		7 .	Menu	Execu Test R	δ VI Name	public double getMaxVelocitvMetersPerSecond(Pose2d	Notes	
CENTRIPETAL ACCELERATION CONSTRAINT		X Docur	X Wenu	Execu Test R	VI Name CentripetalAccelConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double	Notes	
CENTRIPETAL ACCELERATION CONSTRAINT	X		Menu	Execu Test R	% VI Name CentripetalAccelConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	Notes	
CENTRIPETAL ACCELERATION CONSTRAINT	X		Menu	Execu Test R	δ VI Name	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax		
CENTRIPETAL ACCELERATION CONSTRAINT	X	X	X Menu	Execu Test R	% VI Name CentripetalAccelConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax		
CENTRIPETAL ACCELERATION CONSTRAINT	X	X	X Menu	Execu Test R	% VI Name CentripetalAccelConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)		
CENTRIPETAL ACCELERATION CONSTRAINT	X	X	X Wenu		CentripetalAccelConstraint_getMaxVelocity.vi CentripetalAccelConstraint_getMinMaxAccel.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)		
CENTRIPETAL ACCELERATION CONSTRAINT	X	X	X Wenu	Execu Test R	% VI Name CentripetalAccelConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public CentripetalAccelerationConstraint(double		
CENTRIPETAL ACCELERATION CONSTRAINT	X	X	X Wenu		CentripetalAccelConstraint_getMaxVelocity.vi CentripetalAccelConstraint_getMinMaxAccel.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)		
CENTRIPETAL ACCELERATION CONSTRAINT	X	X	X Wenu		CentripetalAccelConstraint_getMaxVelocity.vi CentripetalAccelConstraint_getMinMaxAccel.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public CentripetalAccelerationConstraint(double		
CENTRIPETAL ACCELERATION CONSTRAINT	X	X	X Wenu		CentripetalAccelConstraint_getMaxVelocity.vi CentripetalAccelConstraint_getMinMaxAccel.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public CentripetalAccelerationConstraint(double		
CENTRIPETAL ACCELERATION CONSTRAINT	X	X	X Wenu		CentripetalAccelConstraint_getMaxVelocity.vi CentripetalAccelConstraint_getMinMaxAccel.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public CentripetalAccelerationConstraint(double		
CENTRIPETAL ACCELERATION CONSTRAINT	X	X	X Wenu	otimized SQ	CentripetalAccelConstraint_getMaxVelocity.vi CentripetalAccelConstraint_getMinMaxAccel.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public CentripetalAccelerationConstraint(double		
CENTRIPETAL ACCELERATION CONSTRAINT	X	X	X Wenu	Optimized 92	CentripetalAccelConstraint_getMaxVelocity.vi CentripetalAccelConstraint_getMinMaxAccel.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public CentripetalAccelerationConstraint(double		
CENTRIPETAL ACCELERATION CONSTRAINT	X	X	X Wenu	Optimized 92	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) public CentripetalAccelerationConstraint(double		
CENTRIPETAL ACCELERATION CONSTRAINT	X	X X X MPILIB	X Wenu	ution Optimized 92 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) public CentripetalAccelerationConstraint(double		
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2023 – renamed library. Added additional o								
DIFF DRIVE VOLTAGE CONSTRAINT				X		DiffDriveVoltageConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
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	X	X		X S	I	DiffDriveVoltageConstraint_New.vi	public DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	
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	nplemente	ocumente	Not WPILIB	Menu Item	Test Routine	on Name	Function Dratature	Nata
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	X	X		Х		EllipRegionConstraint_getMinMaxAccel.vi		
	X	X		X X	1	EllipRegionConstraint_IsPoseInRegion.vi EllipRegionConstraint_New.vi		
		X		۸		ElliphegionConstraint_New.vi		
1507	Implemented	Documented	Not WPILIB	Menu Item	st Ro	N Name		Notes
JERK CONSTRAINT	T /		X			JerkConstraint_getMaxVelocity.vi JerkConstraint_getMinMaxAccel.vi	Routine exists, it is just a shell Routine exists, it is just a shell	FUTURE FUTURE
	/		X		,	JerkConstraint New.vi	Routine exists, it is just a shell	FUTURE
MAX VELOCITY CONSTRAINT	X Implemented	Documented	Not WPILIB	anu Item	Routii	Nampole No Name	Function Prototype	Notes
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JM DRIVE KINEMATICS CONSTRAINT	X X Implemented	X X Documented	Not WPILIB	X Menu Item	Test Routine	MaxVelocityConstraint_getMaxVelocity.vi MaxVelocityConstraint_getMinMaxAccel.vi MaxVelocityConstraint_New.vi WaxVelocityConstraint_New.vi VI Name MecaDriveKinematicsConstraint_getMaxVelocity.vi	Function Prototype	Notes
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WPILib LabVIEW Math Library - VI Implementation List Revision 3.X 1/11/2023 – renamed library. Added additional documentation. Notes Function Prototype public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)
public MinMax SWERVE DRIVE KINEMATICS CONSTRAINT X SwerveDriveKinematicsConstraint getMaxVelocity.vi SwerveDriveKinematicsConstraint_getMinMaxAccel.vi getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) Newpublic SwerveDriveKinematicsConstraint(final SwerveDriveKinematics kinematics, double X Χ SI SwerveDriveKinematicsConstraint_New.vi Can use cluster pack for now maxSpeedMetersPerSecond) Function Prototype Notes TrajConstraint_GetMaxVelocity.vi
TrajConstraint_GetMinMaxAccel.vi TRAJECTORY CONSTRAINT Χ X X X X X X X X X X TrajConstraint GetType.vi Function Prototype Notes TRAJECTORY CONSTRAINT (Min Max) X X Constraint_MinMax_New X SI Constraint_MinMax_New.vi XX X SI Constraint MinMax NewMinMax.VI Constraint MinMax New '======== UTILITY

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

JAVA / C++ WPILIB EQUIVALENT

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program NI Name	Function Prototype	Notes
UTIL	Χ	Χ	X	Χ	SI		Util_ApproxEqual.vi		
	Χ	X	X	X			Util_Array_PoseWCurv_to_XY.vi		
	Χ	X	X	X	SI		Util_CalcDist.vi		
	Χ	X	X	X	SI		Util_GetLibraryVersion.vi		
	Χ	X	X	X	SI		Util_GetLibUsage.vi		
	X	X	X	X			Util_GetTime.vi		Once tested completely, this should be optimized!
	Χ	Χ	X	No	N/A		Util_LibraryGlobals.vi		Global Variables – no block diag.
	Χ	Χ	X	X			Util_Trajectory_Absolute_To_Relative.vi		
	Χ	X	X	X			Util_Trajectory_ReadFile.vi		
	X	Χ	X	X			Util_Trajectory_to_XY.vi		
	Χ	Χ	X	No			Util_Trajectory_WriteFile_Config.vi		internal
	X	Χ	X	No			Util_Trajectory_WriteFile_OneState.vi		internal
	Χ	X	X	X			Util_Trajectory_WriteFile_PathFinder.vi		
	Χ	X	X	No			Util_Trajectory_WriteFile_PathFinderConfig.vi		internal
	X	X	X	X			Util_Trajectory_WriteFile_Pathweaver.vi		
	Χ	Χ	X	No			Util_Trajectory_WriteFile_States.vi		internal
	X	Χ	X	No			Util_Trajectory_WriteFile_WayPoints.vi		internal
	Χ	X	X	X			Util_Trajectory_WriteFile.vi		

Revision 3.X 1/11/2023 – renamed library. Added additional documentation

d	ocume	ntatio	n.			
	X	Χ	X	X	Util_TrajectoryState_Meters_To_Inches.vi	
	X	Χ	X	Χ	Util_TrajState_to_DiffDrive_WheelPos.vi	
	X	Χ	Χ	X	Util_DispWaypoint_Eng_To_SI.vi	
	X	Χ	Χ	X	Util_DispWaypoint_To_CubicInput.vi	
	X	Χ	Χ	Χ	Util_DispWaypoint_To_QuinticInput.vi	
	X	Χ	X	Χ	Util_DispWeightedWaypiont_Eng_To_WeightedWaypoint	
	X	Χ	X	No	Util DispWeightedWayPoint To WeightedWayPoint.vi	Sorry about the confusing name

'====== CONVERSIONS

'========

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

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

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

'===== PATHFINDER UTIL

'========

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

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

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

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

DIFFERENTIAL DRIVE POSE ESTIMATOR X X X X V DISTRIBUTION OF CONTRACT OF CONTRA

OVIEW Main Library – Vi implementation L										
1/11/2023 – renamed library. Added additional			\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		D:WD: D					
	X	X	X		DiffDrivePoseEst_FillStateVector.vi					
		X	X		DiffDrivePoseEst_GetEstimatedPosition.vi					
		X	X		DiffDrivePoseEst_Kalman_F_Callback.vi					
		X	X		DiffDrivePoseEst_Kalman_H_Callback.vi					
		X	X		DiffDrivePoseEst_New.vi					
	X	X	X		DiffDrivePoseEst_ResetPosition.vi					
	X	X	X		DiffDrivePoseEst SetVisionMeasurementStdDevs.vi					
	X	X	X		DiffDrivePoseEst Update.vi					
		X	X		DiffDrivePoseEst_UpdateWithTime.vi					
		X	X		DiffDrivePoseEst VisionCorrect Callback.vi					
		X	X		DiffDrivePoseEst VisionCorrect Kalman H Callback.vi					
		Λ			Dilibriver oscist_visionooneet_taiman_f1_oaiiback.vi					
				g						
				iże	•					
				tin	a				_	Ø
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	ute	Li nite	Ti.	2	Ĕ Ĕ			, X	g	ec
	ше	cumen t WPIL.	Ite	Execution O	စ် စ			Å.	2	\mathcal{E}
)e	i Ci	Menu	726	dr dr			qe	st F	ŏ
	Ĕ	å §	Νe	EX E	δ VI Name	Function Prototype	Notes	Š	ě	ii.
EXTENDED KALMAN FILTEI	RX	\overline{X}	\overline{X}		ExtendedKalmanFilter Correct OnlyUY.vi	71				
		X	X		ExtendedKalmanFilter Correct.vi		Just a shell, not functional!			
		X	X		ExtendedKalmanFilter GetP Single.vi		Just a shell, flot full clional:			
		X	X		ExtendedKalmanFilter_GetP.vi					
		X	X		ExtendedKalmanFilter_GetXHat_Single.vi					
		X	X		ExtendedKalmanFilter_GetXHat.vi					
		Χ	X		ExtendedKalmanFilter_New.vi					
	X	X	X		ExtendedKalmanFilter_Predict.vi					
	X	X	X		ExtendedKalmanFilter Reset.vi					
		X	X		ExtendedKalmanFilter SetP.vi					
		X	X		ExtendedKalmanFilter_SetXHat_Single.vi					
		X	X		ExtendedKalmanFilter_SetXHat.vi					
	<i>x</i>			imized	w _a					6
	lemented	umented: WPILIB	nu Item	cution Optimized	ram			te Review	t Program	or Checking
	mplemented	ocumented ot WPILIB	nu Item	Execution Optimized	ram	Function Prototype	Notes	code Review	Fest Program	Error Checking
KAI MAN EII TEI	Implemented	Documented Not WPILIB	Menu Item	Execution Optimized	Name NI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILTEI	X Implemented	X Documented Not WPILIB	X Menu Item	Execution Optimized	E E E E E E E E E E E E E E E E E E E	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILTEI	X X Implemented	X X Documented Not WPILIB	X Menu Item		VI Name KalmanFilter_Correct.vi KalmanFilter_GetK	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILTEI	X X X X X X X X X X X X X X X X X X X	X X Documented Not WPILIB	X Wenu Item		VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILTEI	X X X X X X	X Documented Not WPILIB	X X Wenu Item)	VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILTEI	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 Wenu Item)	VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILTEI	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)	VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_New.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILTEI	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)	VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_New.vi KalmanFilter_New.vi KalmanFilter_Predict.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILTEI	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)	VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_New.vi KalmanFilter_New.vi KalmanFilter_Predict.vi KalmanFilter_Reset.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILTEI	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)	VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_Pedict.vi KalmanFilter_New.vi KalmanFilter_Reset.vi KalmanFilter_Reset.vi KalmanFilter_SetXHat	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILTEI	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)	VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_New.vi KalmanFilter_New.vi KalmanFilter_Predict.vi KalmanFilter_Reset.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILTEI	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)	VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_Pedict.vi KalmanFilter_New.vi KalmanFilter_Reset.vi KalmanFilter_Reset.vi KalmanFilter_SetXHat	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILTEI	ted X X X X X X X X X X X X X X X X X X X	Not WPILIB	Item X X X X X X X X X X X X X X X X X X X)))))))))))))))))))	VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_DetXHat KalmanFilter_New.vi KalmanFilter_New.vi KalmanFilter_Predict.vi KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat_Single		Notes	ode Review Code Review	st Program Test Program	or Checking Error Checking
KALMAN FILTEI	X X X X X X X X X X X X X X X X X X X	ed Well IB	Item X X X X X X X X X X X X X X X X X X X	ptimized	VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_DetXHat KalmanFilter_New.vi KalmanFilter_New.vi KalmanFilter_Predict.vi KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat_Single	Function Prototype Function Prototype	Notes	Code Review	Test Program	Error Checking
	Implemented X X X X Implemented	Documented X X X X X X X X X X X X X X X X X X X	Menu Item X X X X X X X X X X X X X X X X X X)))))))))))))))))))	VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_New.vi KalmanFilter_New.vi KalmanFilter_New.vi KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat VI Name			Code Review	Test Program	ror Checking
KALMAN FILTER	X X X Implemented X X X X Implemented	X X Documented X X X X X X X X X X X X X X X X X X X	X Wenu Item)))))))))))))))))))	VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_New.vi KalmanFilter_New.vi KalmanFilter_Predict.vi KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat_Single	Function Prototype		Code Review Code Review	Test Program	ror Checking
	X X X Implemented X X X X Implemented	Documented X X X X X X X X X X X X X X X X X X X	Menu Item X X X X X X X X X X X X X X X X X X)))))))))))))))))))	VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_New.vi KalmanFilter_New.vi KalmanFilter_New.vi KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat VI Name	Function Prototype		Code Review	Test Program	ror Checking
	X X X Implemented X X X X Implemented	X X Documented X X X X X X X X X X X X X X X X X X X	X Wenu Item)))))))))))))))))))	VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_New.vi KalmanFilter_New.vi KalmanFilter_Predict.vi KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat_Single	Function Prototype		Code Review Code Review	Test Program	ror Checking
	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 Wenu Item)))))))))))))))))))	Solution Solution	Function Prototype		Code Review Code Review	Test Program	ror Checking
	R 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 Wenu Item)))))))))))))))))))	VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_New.vi KalmanFilter_Predict.vi KalmanFilter_Reset.vi KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat_Single KalmanFilter_SetXHat_Single KalmanFilter_SetXHat_Single KalmanFilter_SetXHat_Single KalmanFilter_SetXHat_Single KalmanFilter_SetXHat_Single KalmanFilter_SetXHat_Single KalmanFilter_SetXHat_Single KalmanFilter_SetXHat_Single	Function Prototype		Code Review Code Review	Test Program	ror Checking
	R 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 Wenu Item)))))))))))))))))))	Solution Solution	Function Prototype		Code Review Code Review	Test Program	ror Checking

11/2023 – renamed library. Added additional do					imized				
	ented	ented	IL IB	Item	cution Opt			eview	ogram
	трІет	Docume	Vot WPILIB	nu	Execution	VI Name Function Prototype	Notes	Code R	Fest Pr
MECANUM DRIVE POSE ESTIMATOR					<u> </u>	MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi	11003		
	X			X		MecaDrivePoseEst_AddVisionMeasurement.vi			-
	X			X No		MecaDrivePoseEst_GetEstimatedPosition.vi MecaDrivePoseEst_Kalman_F_Callback.vi			
	Χ	X		No		MecaDrivePoseEst_Kalman_H_Callback.vi			
	X			X		MecaDrivePoseEst_New.vi			
	$\frac{\lambda}{X}$			X		MecaDrivePoseEst_ResetPosition.vi MecaDrivePoseEst_SetVisionMeasurementStdDevs.vi			
	Χ	X		Χ		MecaDrivePoseEst_Update.vi			
	X			X No		MecaDrivePoseEst_UpdateWithTime.vi MecaDrivePoseEst_VisionCorrect_Callback.vi			
	\hat{x}			No		MecaDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi			
					nized				
	lemented	Documented	Vot WPILIB	Menu Item	Execution Optin			le Review	t Program
	dwl	Оос	Not	Mer	Exe	VI Name Function Prototype	Notes	Coo	Tes
SWERVE DRIVE POSE ESTIMATOR				V/		SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi			
-	X	$\frac{X}{X}$		X		SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst GetEstimatedPosition.vi			
	Χ	X		Χ		SwerveDrivePoseEst Kalman F Callback.vi			
	X			X		SwerveDrivePoseEst_Kalman_H_Callback.vi			
	X			X		SwerveDrivePoseEst_New.vi SwerveDrivePoseEst_ResetPosition.vi			
	Χ	X		X		SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi			
	X			X		SwerveDrivePoseEst_Update.vi SwerveDrivePoseEst_UpdateWithTime.vi			
	Χ	X		X		SwerveDrivePoseEst_VisionCorrect_Callback.vi			
	Χ	X		X		SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi			
UNSCENTED KALMAN FILTER	× Implemented	x Documented	Not WPILIB	X Menu Item	Execution Optimized	VI Name Function Prototype UnscentedKalmanFilter Correct FuncGroup.vi	Notes	Code Review	Test Program
	Χ	X		X		UnscentedKalmanFilter_Correct_OnlyUY.vi			
	X			X		UnscentedKalmanFilter_Correct_OnlyUYR.vi			
				X		UnscentedKalmanFilter_Correct.vi UnscentedKalmanFilter_GetP_Single.vi			
	Χ	X		Χ		UnscentedKalmanFilter_GetP.vi			
	X			X		UnscentedKalmanFilter_GetXHat_Single.vi UnscentedKalmanFilter GetXHat.vi			
The state of the s	X			X		UnscentedKalmanFilter_GetXHat.vi UnscentedKalmanFilter_New_Default.vi			
		X		Χ		UnscentedKalmanFilter_New_FuncGroup.vi			
				X		UnscentedKalmanFilter_New.vi UnscentedKalmanFilter_Predict.vi			
	X						I .	1	
	X	X		X		UnscentedKalmanFilter_Reset.vi			
	X X X X	X X X		X X X		UnscentedKalmanFilter_Reset.vi UnscentedKalmanFilter_SetP.vi			
	X X X	X X X X		X X		UnscentedKalmanFilter_Reset.vi			

STATE SPACE CONTROL

CONTROL AFFINE PLANT INVERSION FEEDFORWARD	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized Test Routine	Sample Program Name	Function Prototype Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE ACCELERATION LIMITER	X X Implemented	X X Documented	Not WPILIB	X X Menu Item	Execution Optimized X X Test Routine	DiffDrvAccelLimit_Calculate.vi	Function Prototype Notes	Code Review	Test Program	Error Checking
IMPLICIT MODEL FOLLOWER	X X X	X X X	Not WPILIB	X X Wenu Item	Execution Optimized X X X X Test Routine	ImplModelFollow_Calculate.vi ImplModelFollow_GetU.vi ImplModelFollow_GetU_Single.vi ImplModelFollow_New.vi ImplModelFollow_New_Plant.vi	Function Prototype Notes	Code Review	Test Program	Error Checking
LINEAR PLANT INVERSION FEEDFORWARD	X X Implemented	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	mple Program	Function Prototype Notes	Code Review	Test Program	Error Checking
	X X X X	X X X	Not WPILIB	Item X	Execution Optimized Test Routine	LinearPIntInvFF_GetUff.vi LinearPIntInvFF_New_Plant.vi LinearPIntInvFF_New.vi LinearPIntInvFF_Reset_Initial.vi LinearPIntInvFF_Reset_Zero.vi		le Review	t Program	or Checking
LINEAR QUADRATIC REGULATOR	X	Χ		X X	Exer Test	VI Name LinearQuadraticRegulator_Calculate_NextR.vi LinearQuadraticRegulator_Calculate.vi LinearQuadraticRegulator_GetK_Single vi	Function Prototype Notes	RIGINAI	Test	Erro

Revision 3.X	1/11/2023 - renamed library.	Added additional docume

al docume	entatio	n.						
X	X		Χ	Χ	LinearQuadraticRegulator_GetK.vi			
X	Χ		Χ		LinearQuadraticRegulator_GetR_Single.vi			
X	Χ		Χ		LinearQuadraticRegulator_GetR.vi			
X	X		Χ		LinearQuadraticRegulator_GetU_Single.vi			
X	X		Χ		LinearQuadraticRegulator_GetU.vi			
X	X		X	Χ	LinearQuadraticRegulator_LatencyCompensate.vi	Routine exists, but it only has interger raise matrix to power.		
X	X		Χ		LinearQuadraticRegulator_New_ELMS.vi			
X	X		Χ		LinearQuadraticRegulator_New_N.vi			
					LinearQuadraticRegulator_New_Raw.vi			
X	X		Χ	Χ	LinearQuadraticRegulator_New_SystemELMS.vi			
X	X		Χ		LinearQuadraticRegulator_New.vi			
X	X		Χ		LinearQuadraticRegulator_Reset.vi			

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
LINEAR SYSTEM	Χ	Χ		X	1			LinearSystem_CalculateX.vi					
	Χ	Χ		Χ	1			LinearSystem_CalculateY.vi					
	Χ	Χ		X	SI			LinearSystem_GetA.vi					
	Χ	Χ		X	SI			LinearSystem_GetAElement.vi					
	Χ	Χ		X	SI			LinearSystem_GetB.vi					
	Χ	Χ		X	SI			LinearSystem_GetBElement.vi					
	Χ	Χ		X	SI			LinearSystem_GetC.vi					
	Χ	Χ		X	SI			LinearSystem_GetCElement.vi					
	Χ	Χ		X	SI			LinearSystem_GetD.vi					
	Χ	Χ		X	SI			LinearSystem_GetDElement.vi					
	Χ	Χ		Χ	SI			LinearSystem_New.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program Bangle Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
LINEAR SYSTEM LOOP		Χ		Χ			LinearSystemLoop_ClampInput.vi					
	X	Χ		Χ			LinearSystemLoop_Correct.vi					
							LinearSystemLoop_GetClampFunction.vi					
	Χ	Χ		Χ			LinearSystemLoop_GetController.vi					
	Χ	Χ		Χ			LinearSystemLoop_GetError_Single.vi					
	Χ	Χ		Χ			LinearSystemLoop_GetError.vi					
	Χ	Χ		Χ			LinearSystemLoop_GetFeedForward.vi					
	Χ	Χ		Χ			LinearSystemLoop_GetNextR_Single.vi					
	Χ	Χ		Χ			LinearSystemLoop_GetNextR.vi					
	Χ	Χ		Χ			LinearSystemLoop_GetObserver.vi					
	Χ	Χ		Χ			LinearSystemLoop_GetU_Row.vi					
	Χ	Χ		Χ			LinearSystemLoop_GetU.vi					
	Χ	Χ		Χ			LinearSystemLoop_GetXHat_Single.vi					
	Χ	Χ		Χ			LinearSystemLoop_GetXHat.vi					
							LinearSystemLoop_New_BBB					
							LinearSystemLoop_New_LinearSystem_ClampFunc					
	Χ	Χ		Χ			LinearSystemLoop_New_LinearSystem_ClampVal.vi					
	Χ	Χ		Χ			LinearSystemLoop_New.vi					
	Χ	Χ		Χ			LinearSystemLoop_Predict.vi					
	Χ	Χ		Χ			LinearSystemLoop_Reset.vi					
							LinearSystemLoop_SetClampFunction.vi					
							LinearSystemLoop_SetNextR_Some.vi					
	Χ	Χ		X			LinearSystemLoop_SetNextR.vi					
							LinearSystemLoop_SetXHat_Single.vi					
							LinearSystemLoop_SetXHat.vi					
	1		1			1						

3.X 1/11/2023 – renamed library. Added additional	plemented	Documented	Not WPILIB	Menu Item Execution Optimized	Test Routine	Sample Program			Code Review	est Program	ror Checking
LTV DIFFERENTIAL DRIVE CONTROLLER	. <u> </u>			Ž ψ		VI Name LTVDiffDriveCtrl Calculate.vi	Function Prototype	Notes	<u> </u>	<u> </u>	<u>Ü</u>
ETV BILLENTIAL BRIVE GONTROLLE	X	X		X		LTVDiffDriveCtrl_New.vi					
	X	X		X		LTVDiffDriveCtrl_Calculate_TrajState.vi					
	X	X		X X		LTVDiffDriveCtrl_Calculate_SetTolerance.vi LTVDiffDriveCtrl_Calculate_AtReference.vi					
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	Implemented	Documented	Not WPILIB	Menu Item Execution Optim	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
LTV UNICYCLE CONTROLLER	$\mathbf{R} \stackrel{\frown}{X}$	X		X	X	LTVUnicycleCtrl_AtReference.vi					
	X	X		X X	X	LTVUnicycleCtrl_Calculate_TrajState.vi LTVUnicycleCtrl_Calculate.vi					
	X	X		X	X	LTVUnicycleCtrl_New.vi					
	X	X		X	X	LTVUnicycleCtrl SetEnabled.vi					
	X	X		X	X	LTVUnicycleCtrl_SetTolerance.vi					
	lemented	sumented	: WPILIB	nu Item cution Optimized	t Routine	nple Program			de Review	:t Program	or Checking
	Implemented		Not N	Menu Execu	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
CALLBACK HELPE		X	¥ ₹ X .	X Menu Execu	Test Routine	CallbackHelp_MatrixMinus.vi	Function Prototype	Notes	Code Review	Test Program	Frror Checking
CALLBACK HELPE	X	X	X X X	X Wenu X Execu	Test Routine	CallbackHelp_MatrixMinus.vi CallbackHelp_MatrixMult_CoerceSizeB.vi	Function Prototype	Notes	Code Review	Test Program	Frror Checking
CALLBACK HELPE	X	X	X	X X Wenu X X	Test Routine	CallbackHelp_MatrixMinus.vi	Function Prototype	Notes	Code Review	Test Program	Fron Cherking
CALLBACK HELPE	X	X X X	X	X X Wenu X X	Test Routine	CallbackHelp_MatrixMinus.vi CallbackHelp_MatrixMult_CoerceSizeB.vi CallbackHelp_MatrixMult.vi	Function Prototype	Notes	Code Review	Test Program	Error Checkina
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	X X X X X X X X X X	Documented X X	Not WPILIB	Menu Item X X X X Menu X X X X Menu Execution Optimized	Test Routine	CallbackHelp_MatrixMinus.vi CallbackHelp_MatrixMult_CoerceSizeB.vi CallbackHelp_MatrixMult.vi CallbackHelp_MatrixPlus.vi	Function Prototype Function Prototype	Notes	Code Review Code Review	Test Program	Fror Checking
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	Implemented X X X X Implemented	Documented X X X X X X X X X X X X X X X X X X X	Not WPILIB Not WPILIB	Menu Item X X X X Menu Item X X X X Menu Execution Optimized Execution Optimized	X X X X X X X X X X X X X X X X X X X	CallbackHelp_MatrixMinus.vi CallbackHelp_MatrixMult_CoerceSizeB.vi CallbackHelp_MatrixMult.vi CallbackHelp_MatrixPlus.vi VI Name Discretization_DiscretizeA.vi Discretization_DiscretizeAB.vi Discretization_DiscretizeAB.vi Discretization_DiscretizeAB.vi Discretization_DiscretizeAB.vi Discretization_DiscretizeAB.vi Discretization_DiscretizeAB.vi Discretization_DiscretizeAB.vi Discretization_DiscretizeAB.vi			de Review	Test Program Test Program Test Program	Error Checking Error Checking

evision 3.X 1/11/2023 – renamed library. Added additional docu	umenta	tion.					
	$X \mid X$	(X		StateSpaceUtil_ClampInputMaxMagnitude.vi	Routine exists, it is just a shell	
	$X \mid X$	(X		StateSpaceUtil_IsDetectable.vi		
	$X \mid X$	(X		StateSpaceUtil_IsStabalizable.vi		
	$X \mid X$	(X	Χ	StateSpaceUtil_MakeCostMatrix.vi		
	$X \mid X$	(X	X	StateSpaceUtil_MakeCovarianceMatrix.vi		
	$X \mid X$	(X		StateSpaceUtil_MakeWhiteNoiseVector.vi		
	$X \mid X$	(X		StateSpaceUtil_NomalizeInputVector.vi		
	$X \mid X$	(X		StateSpaceUtil_PoseTo3dVector.vi		
	$X \mid X$	(X		StateSpaceUtil_PoseTo4dVector.vi		
	$X \mid X$	(X		StateSpaceUtil_PoseToVector.vi		

'======= SIMULATION

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
BATTERY SIM	X	Χ		Χ	SI		BatterySim_CalculateDefaultBatteryLoadedVoltage.vi					
	Χ	Χ		Χ	SI		BatterySim_CalculateLoadedVoltage.vi					

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optim	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE TRAIN SIM	Χ	Χ		Χ				DiffDriveTrainSim_ClampInput.vi					
	Χ	Χ		X				DiffDriveTrainSim_CreateKitbotSim_EstMass.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_CreateKitbotSim.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_GetCurrentDrawAmps.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_GetCurrentGearing.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_GetDynamics.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_GetHeading.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_GetLeftPositionMeters.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_GetOutput_Single.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_GetPose.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_GetRightCurrentDrawAmps.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_GetRightPositionMeters.vi					
	Χ	Χ		X				DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_GetState_Single.vi					
	X	Χ		X				DiffDriveTrainSim_GetState.vi					

1/11/2023 - renamed library. Added additional do											
	Χ	Χ		Χ		DiffDriveTrainSim_KitBotWheelSize.vi					
		Χ		Χ		DiffDriveTrainSim_New_Mass_MOI.vi					
		Χ		Χ		DiffDriveTrainSim_New.vi					
	Χ			Χ		DiffDriveTrainSim_SetCurrentGearing.vi					
	Χ			Χ		DiffDriveTrainSim_SetInputs.vi					
	Χ			Χ		DiffDriveTrainSim_SetPose.vi					
	Χ	Χ		Χ		DiffDriveTrainSim_SetState.vi					
	Χ	X		Χ		DiffDriveTrainSim_ToughBoxMiniGearRatio.vi					
	Х	Χ		Χ		DiffDriveTrainSim_ToughBoxMiniMotor.vi					
	Х			Χ		DiffDriveTrainSim Update.vi					
ELEVATOR SIM	X X X	X		X Wenu Item	Execution Optimized Test Routine	VI Name ElevatorSim_GetCurrentDraw.vi ElevatorSim_GetPositionMeters.vi ElevatorSim_GetVelocityMetersPerSecond.vi ElevatorSim_HasHitLowerLimit.vi ElevatorSim_HasHitUpperLimit.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	Χ	Χ	+	۸							
						ElevatorSim_New_LinSys_NoNoise.vi					
			\vdash	-		ElevatorSim_New_LinSys.vi					
	V	\ \ \		V		ElevatorSim_New_NoNoise.vi					
	X		V	X		ElevatorSim_New.vi					
_	X	X	X			ElevatorSim_RKF45_Func.vi					
-	X			X		ElevatorSim_SetInputVoltage.vi					
	Χ	Χ		Χ		ElevatorSim_SetState.vi					
	X	X	X	X		ElevatorSim_Update.vi		Needed because this doesn't			
-	.,			14				extend.			
-	X			X		ElevatorSim_UpdateX.vi					
	Χ	Χ		Χ		ElevatorSim_WouldHitLowerLimit.vi					
	X	X		~							
				Χ	ized	ElevatorSim_WouldHitUpperLimit.vi					
FLYWHEEL SIM	X X Implemented	X X Documented		X Wenu Item	Execution Optimized 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_SetInput.vi FlyWheelSim_SetState.vi FlyWheelSim_Update.vi	Function Prototype	Notes Future Future Future	Code Review	Test Program	Error Checking
FLYWHEEL SIM	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Not WPILIB	X X X X X	ution Routii	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_SetInput.vi FlyWheelSim_SetState.vi	Function Prototype Function Prototype	Future Future	Code Review Code Review	Test Program	Error Checking Error Checking

WPILib LabVIEW Math Library – VI Implementation L Revision 3.X 1/11/2023 – renamed library. Added additional	docume	ntation.									
,	X	X	X			LinearSystemSim SetInput Array.vi		Doesn't use clamp?			
	X	X	X			LinearSystemSim_SetInput_Single.vi		·			
	X	X	X			LinearSystemSim_SetInput.vi					
	X	X	X			LinearSystemSim_Setstate.vi					
	X	X	X			LinearSystemSim_Update.vi					
	X	X	No			LinearSystemSim_UpdateX.vi					
	X	XX	No			LinearSystemSim_UpdateY.vi					
SINGLE JOINT ARM SI	N 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	VI Name SngJntArmSim_EsitmateMOI.vi SngJntArmSim_GetAngleRads.vi SngJntArmSim_GetCurrentDraw.vi SngJntArmSim_GetVelocityRadsPerSec.vi SngJntArmSim_HasHitLowerLimit.vi SngJntArmSim_HasHitUpperLimit.vi SngJntArmSim_New.vi SngJntArmSim_Rkf45_Func.vi SngJntArmSim_SetInputVoltage.vi SngJntArmSim_SetState.vi SngJntArmSim_Update.vi SngJntArmSim_Update.vi SngJntArmSim_Update.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
		X	X			SngJntArmSim_WouldHitLowerLimit.vi					
	X	X	X			SngJntArmSim_WouldHitUpperLimit.vi					
						ongona amem_wearan mepper zimian					
·											
MATRIX UTILITIES '=========	Implemented	. Documented Not WPILIB			Test Routine	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATRIX UTILITIES	$R \stackrel{\sim}{X}$	\overline{X}	X	SI	Test Routine	VI Name MatBuilder_Create.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATRIX UTILITIES '=========	-	\overline{X}	X		Test Routine	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATRIX UTILITIES '=========	rted X	XXX	x X	Optimized 19 19	Routine	VI Name MatBuilder_Create.vi MatBuilder_Fill.vi			Sode Review Code Review	Fest Program Test Program	error Checking Error Checking
MATRIX UTILITIES '========= MAT BUILDE	Implemented X X I	Documented X X X	Menu Item	Execution Optimized ග ග	st Routine	VI Name MatBuilder_Create.vi MatBuilder_Fill.vi	Function Prototype Function Prototype	Notes Notes	Code Review Code Review	Test Program Test Program	Error Checking Error Checking
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MATRIX UTILITIES '========= MAT BUILDE	R X X Implemented	X Documented X X Not WPILIB	X X Wenu Item	ର Execution Optimized ଓ ଓ	Routine	VI Name MatBuilder_Create.vi MatBuilder_Fill.vi VI Name Matrix_AssignBlock.vi Matrix_Block.vi Matrix_ChangeBoundsUnchecked.vi Matrix_Create.vi			Code Review Code Review	Test Program Test Program	Error Checking Error Checking
MATRIX UTILITIES '========= MAT BUILDE	R 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 Wenu Item	ର ଓ Execution Optimized	Routine	VI Name MatBuilder_Create.vi MatBuilder_Fill.vi VI Name Matrix_AssignBlock.vi Matrix_Block.vi Matrix_ChangeBoundsUnchecked.vi Matrix_Det.vi Matrix_Det.vi			Code Review Code Review	Test Program Test Program	Error Checking Error Checking
MATRIX UTILITIES '========= MAT BUILDE	R X X	X X Not WPILIB	X X Wenu Item	ଏ ଓ Execution Optimized ଓ ଓ	Routine	VI Name MatBuilder_Create.vi MatBuilder_Fill.vi VI Name Matrix_AssignBlock.vi Matrix_Block.vi Matrix_ChangeBoundsUnchecked.vi Matrix_Create.vi Matrix_Det.vi Matrix_Diag.vi		Notes	Code Review Code Review	Test Program Test Program	Error Checking Error Checking
MATRIX UTILITIES '========= MAT BUILDE	R 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 Wenu Item	ର ଓ Execution Optimized	Routine	VI Name MatBuilder_Create.vi MatBuilder_Fill.vi VI Name Matrix_AssignBlock.vi Matrix_Block.vi Matrix_ChangeBoundsUnchecked.vi Matrix_Create.vi Matrix_Det.vi Matrix_Diag.vi Matrix_Div_Scalar.vi			Code Review Code Review	Test Program Test Program	Error Checking Error Checking
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						Normalista months DIGAS From Charif		functions.			
						NumIntegrate_RKf45_Func_Ch.vi		Removed. Replaced with newer functions.			
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	X	V	No	,		NumIntegrate_Rkf45_Impl.vi		functions.			
	$\frac{\lambda}{X}$	$\frac{\lambda}{X}$	X			NumIntegrate_Rkf45_Impl.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.			
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NUMERICAL JACOBIAN	X Implemented X X Implemented X Implemented	Documented X X Documented X Documented Not WPILIB	Menu Item X X Menu Item	Execution Optimized Execution Optimized Execution Optimized	Test Routine	NumIntegrate_Trap_Dbl.vi NumIntegrate_Trap_Mat.vi VI Name RungeKuttaTimeVarying_RK4_Mat_T_Y.vi VI Name NumJacobian_U.vi NumJacobian_X.vi VI Name VI Name	Function Prototype	Notes Notes Notes	Code Review	Program Test Program Test	

WPILib LabVIEW Math Library – VI Implementation List Revision 3.X 1/11/2023 – renamed library. Added additional documentation.

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WPILib LabVIEW Math Library – VI Implementation List
Revision 3.X 1/11/2023 – renamed library. Added additional documentation.
COMMUNICATIONS

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Function Prototype Notes NETWORK UDP X X X X SI NetworkUDP Close.vi NetworkUDP_Receive.vi
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	Турсьс	Z Z X X N/A	AprilTagFieldLayout,ctl			
		Z Z X X N/A	AprilTagFieldLayoutOriginPosition_ENUM.ctl			
		Z Z X X N/A	AprilTagPoseEstimate.ctl			
		Z Z X X N/A	AprilTagFields_ENUM.ctl			
		Z Z X X N/A	ARM_FF.CTL			
		Z Z 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 Z X X N/A	CALLBACK_FUNC_TYPE.CTL		deleted of abalidoried ! !	
		Z Z X X N/A	CHASSIS SPEEDS.CTL			
		Z Z X X N/A	CONTRAINED STATE.CTL			
		Z Z X X N/A	COORDINATE_AXIS.CTL			
		Z Z X X N/A	COORDINATE_SYSTEM.CTL			
		Z Z X X N/A	DCMOTOR_TYPES_ENUM.CTL			
		Z Z X X N/A Z Z X X N/A	DCMOTOR.CTL DCMOTOR SIM.CTL			
		Z Z X X N/A Z Z X X N/A	DEBOUNCER TYPE ENUM.Ctl			
		Z Z X X N/A	DEBOUNCER.CTL			
		Z Z X X N/A	DIFF DRIVE ACCEL LIMIT.CTL			
		Z Z X X N/A	DIFF_DRIVE_KINEMATICS.CTL			
		Z Z X X N/A	DIFF_DRIVE_Kitbot_WheelSize_ENUM.ctl			
		Z Z X X N/A	DiFF_DRIVE_Pose_EST.ctl			
		Z Z X X N/A	DIFF_DRIVE_ToughBoxMini_GearChoice_ENUM.ctl			
		Z Z X X N/A	DIFF_DRIVE_ToughBoxMini_MotorChoice_ENUM.ctl			
		Z Z X X N/A Z Z X X N/A	DIFF_DRIVE_TRAIN_SIM_STATE_ENUM.CTL DIFF_DRIVE_TRAIN_SIM.ctl			
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					UTIL_WEIGHTED_WAYPOINIT.VI	
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		Z Z X X N/A	EXTENDED KALMAN CORRECT FUNC GROUP.CTL			
		Z X X N/A	EXTENDED KALMAN FILTER.CTL			
		Z Z X X N/A	FLYWHEEL SIM.ctl			
		Z Z X X N/A	FUNCTION_GENERATOR.ctl			
		Z Z X X N/A	FUNCTION_GENERATOR_MATRIX.ctl			
		Z Z X X N/A	HOLONOMIC_DRV_CTRL.CTL		New 1/26/21	
		Z Z X X N/A	TIME_INTERPOLATABLE_BOOLEAN.CTL			
		Z Z X X N/A	TIME_INTERPOLATABLE_DOUBLE.CTL			
		Z Z X X N/A Z Z X X N/A	TIME_INTERPOLATABLE_POSE2D.CTL TIME_INTERPOLATABLE_ROTATION2D.CTL			

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Ζ	Ζ	X	X	N/A	KALMAN_FILTER_LATENCY_COMP_FUNC_GROUP.CTL	
Z	Ζ	X	X	N/A	KALMAN_FILTER_LATENCY_COMP.CTL	
Z	Ζ	X	X	N/A	KALMAN_FILTER.ctl	
Z	Ζ	Χ	X	N/A	LINEAR_FILTER.CTL	
Z	Ζ	Χ	Χ	N/A	LINEAR_PLANT_INV_FF.ctl	
Z	Ζ	X	Χ	N/A	LINEAR QUADRATIC REGULATOR.ctl	
Z	Ζ	Χ	Χ	N/A	LINEAR SYSTEM LOOP.ctl	
Z	Ζ	Χ	Χ	N/A	LINEAR SYSTEM SIM.ctl	
Z	Ζ	X	X	N/A	LINEAR SYSTEM.ctl	
Z	Ζ	X	X	N/A	LTV DIFF_DRIVE_CTRL.ctl	
Z	Ζ	X	X	N/A	LTV DIFF DRIVE CTRL STATE ENUM.ctl	
Z	Z	X	X	N/A	LTV UNICYCLE CONTROLLER.CTL	
N/A	_	N/A		N/A	LTV UNICYCLE CONTROLLER INPUT ENUM.ctl	OBSOLETE - Removed
Z	Ζ		Х		LTV UNICYCLE CONTROLLER STATE ENUM.cti	OBSOLETE TROMOTOR
Z	Z	X	X	N/A	MECA DRIVE KINEMATICS.CTL	
Z	Z	X	X	N/A	MECA DRIVE ODOMETRY.CTL	
Z	Z	X	X	N/A	MECA_DRIVE_OBSE_EST.CTL	
Z	Z	X	X	N/A	MECA_DRIVE_T-GSE_ESTIONE MECA_WHEEL POSITIONS.CTL	
Z	Z	X	X	N/A	MECA_WHEEL_FGSTTGNG.CTL MECA_WHEEL_SPEEDS.CTL	
Z	Z	X	X	N/A	MEDIAN FILTER.CTL	
	Z	X	X	N/A	MEDIAN_FILTER.CTL MERWE SCALED SIGMA PTS.ctl	
Z 7	Z	X	X	N/A N/A	OBSERVER SNAP LIST ITEM.CTL	
Z 7	Z			N/A N/A	OBSERVER_SNAP_LIST_TIEM.CTL OBSERVER_SNAPSHOT.CTL	
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Z	Z	X	X	N/A	PARAM_STACK_ITEM.CTL	
Z	Z	X	X	N/A	PARAM_STACK.CTL	
Z	Z	X	X	N/A	PID_ADV_LIMITS.CTL	
Z	Z	X	X	N/A	PID_ADV_TUNING.CTL	
Z	Ζ	X	X	N/A	PID_CONTROLLER.CTL	
Ζ	Ζ	X	Χ	N/A	PID_ERROR_TOLERANCE.CTL	
Z	Ζ	X	X	N/A	PID_INPUT_LIMITS.CTL	
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Ζ	Ζ	X	X	N/A	POSE2D.CTL POSE2D.CTL	
Z	Ζ	X	X	N/A	POSE3D.CTL POSE3D.CTL	
Z	Ζ	X	X	N/A	POSEwCURVATURE.CTL	
Z	Ζ	Χ	X	N/A	PROFILED_PID_CONTROLLER.CTL	
Z	Ζ	Χ	Χ	N/A	QUATERNION.CTL	
Z	Ζ	Χ	Χ	N/A	RAMSETE EXE TUNING.CTL	
Z	Ζ	Х	X	N/A	RAMSETE.CTL	
Z	Ζ	X	X	N/A	ROTATION2D.CTL	
Z	Ζ	X	X	N/A	ROTATION3D.CTL	
Z	Ζ	X	X	N/A	SIMPLE MOTOR FF.CTL	
Z	Ζ	Х		N/A	SIMPLE MOTOR FF KA TUNE PARAMS.CTL	
Z	Z	X	Х	N/A	SINGLE JOINT ARM SIM.CTL	
Z	Z	X	X	N/A	SLEW RATE LIMITER.CTL	
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	7		X	N/A	SWERVE_DRIVE_KINEMATICS.CTL	
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WPILib LabVIEW Math Library – VI Implementation List
Revision 3.X 1/11/2023 – renamed library. Added additional documentation.

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Z	Ζ	X	Χ	N/A	TRAPEZOID_PROFILE_CONSTRAINT.CTL	
Z	Ζ	X	Χ	N/A	TRAPEZOID_PROFILE_STATE.CTL	
Z	Ζ	X	Χ	N/A	TRAPEZOID_PROFILE.CTL	
Z	Ζ	X	Χ	N/A	TWIST2D.CTL	
Ζ	Ζ	X	Χ	N/A	TWIST3D.CTL	
Z	Ζ	X	Χ	N/A	UNSCENTED_KALMAN_CORRECT_FUNC_GROUP.CTL	
Z	Ζ	X	Χ	N/A	UNSCENTED_KALMAN_FILTER.ctl	
Z	Ζ	X	Χ	N/A	UNSCENTED_KALMAN_NEW_FUNC_GROUP.CTL	
Z	Ζ	X	Χ	N/A	UTIL_PATHFINDER_CONFIG.CTL	
N/A		N/A		N/A	WAYPOINTS.CTL WAYPOINTS.CTL	Delete – obsolete
Z	Ζ	X	Χ	NA	WEIGHTED_WAYPOINT.CTL	New V1.5
N/A		N/A		N/A	X_Y_HEADINGS.CTL	Delete – obsolete
Z	Ζ	X	Χ	N/A	X_Y_PAIR.CTL	

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