Revision 3.07 3/20/2023 – Updated Ramsete Execute,, added Field Display

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 98.37% Optimization Pct 59.58%

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

BASE '=======

ANALOG DELAY	X Implemented	X Documented	X Not WPILIB	X Menu Item	- Execution Optimized	Test Routine	S VI Name AnalogDelay_Execute.vi	Function Prototype	Notes Similar to interpolated tree map	Code Review	Test Program	Error Checking
BUMPLESS TRANSFER	X Implemented	X Documented	X Not WPILIB	X Menu Item	- Execution Optimized	Test Routine	S VI Name BumplessTransfer_Execute.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
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FUNCTION GENERATOR		X		X	1		FunctionGenerator Add Value.vi	71	Similar to interpolated tree map		,	
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	X	Χ		Χ	1		FunctionGenerator_Calculate.vi		Similar to interpolated tree map			
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	Χ	Χ	Χ	Χ	1		FunctionGenerator_Execute.vi		Similar to interpolated tree map			
	Χ	X		Χ	SI		FunctionGenerator_New.vi		Similar to interpolated tree map			
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
FUNCTION GENERATOR MATRIX		Χ	Χ	Χ	1		FunctionGeneratorMatrix_Add.vi		Similar to interpolated tree map			
	Χ	Χ	Χ	Χ	1		FunctionGeneratorMatrix_Calculate.vi		Similar to interpolated tree map			
	Χ	Χ	X	Χ	SI		FunctionGeneratorMatrix_New.vi		Similar to interpolated tree map			

FRC_LabVIEW_Trajectory_Library_Routines.xlsx

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Revision 3.07 3/20/2023 – Updated Ramsete Execute,, added Field Display Function Prototype Notes LEAD LAG X X X X I LeadLag Execute.vi VI Name Function Prototype Notes LINEAR FILTER X X XI LinearFilter BackwardFiniteDifference.vi XX X SI LinearFilter Calculate.vi LinearFilter_CutoffFrequency.vi X X X X X X X X X I X LinearFilter Execute.vi Labview style helper LinearFilter Factorial.vi AN INTERNAL ROUTINE No I XX XI LinearFilter FiniteDifference.vi
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3/20/2023 – Updated Ramsete Execute,, added	R X X X X		Timer Close.vi		releases semaphore			
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	edPIDController GetSetpoint.vi				
	edPIDController GetTolerance.vi				
	edPIDController GetVelocityError.vi				
	edPIDController New.vi				
	edPIDController NewPeriod.vi				
	edPIDController Reset PosOnly.vi				
	edPIDController Reset PosVel.vi				
	edPIDController Reset.vi				
	edPIDController SetConstraints.vi				
	edPIDController_SetConstraints.vi				
	edPIDController_SetGoal.vi				
	edPIDController_SetIodal.vi				
	edPIDController_SetIntegratorKange.vi				
	edPIDController SetTolerance PosOnly.vi				
	edPIDController SetTolerance PosVel.vi				
X X X 31 I Tollie	edi iDoditioliei_deti olei ance_i osvei.vi				
were In Sample Program 12		Function Prototype Notes AtReference	Code Review	Test Program	Error Checking
				-	
		calculate_trajectory calculate			
		Use this one!!		+	
		OGO MINO ONO::		+	
V V V V I Domos				+	
	sete_Execute_Ext_Odom.vi		1		1
X X X X I Ramse	sete_Execute_Ext_Odom_ENG.vi				
X X X X I Ramse X X X X SI Ramse	sete_Execute_Ext_Odom_ENG.vi sete_Execute_PackTuning_ENG.vi				
X X X X I Ramse X X X X SI Ramse X X X X SI Ramse	sete_Execute_Ext_Odom_ENG.vi sete_Execute_PackTuning_ENG.vi sete_Execute_PackTuning.vi				
X X X X I Ramse X X X X SI Ramse X X X X SI Ramse X X X X I Ramse	sete_Execute_Ext_Odom_ENG.vi sete_Execute_PackTuning_ENG.vi sete_Execute_PackTuning.vi sete_Execute.vi	now/b_zota)			
X X X X I Ramse X X X X SI Ramse X X X X SI Ramse X X X X I Ramse X X X X SI Ramse	sete_Execute_Ext_Odom_ENG.vi sete_Execute_PackTuning_ENG.vi sete_Execute_PackTuning.vi sete_Execute.vi sete_New_B_Z.vi	new(b, zeta)			
X X X X I Ramse X X X X X SI Ramse X X X X X I Ramse X X X X SI Ramse X X X X SI Ramse X X X SI Ramse	sete_Execute_Ext_Odom_ENG.vi sete_Execute_PackTuning_ENG.vi sete_Execute_PackTuning.vi sete_Execute.vi sete_New_B_Z.vi sete_New.vi	new(b, zeta) new SetEnabled			
X X X X I Ramse X X X X SI Ramse X X X X SI Ramse X X X X I Ramse X X X X SI Ramse	sete_Execute_Ext_Odom_ENG.vi sete_Execute_PackTuning_ENG.vi sete_Execute_PackTuning.vi sete_Execute.vi sete_New_B_Z.vi				

Revision 3.07 3/20/2023 – Updated Ramsete Execute,, added Field Display Ramsete SINC.vi sinc internal Function Prototype Notes SIMPLE MOTOR FEEDFORWARD X X X X SI SimpleMotorFF Calculate CalcAccel.vi SimpleMotorFF Calculate NextV Dt.vi XX Χ X SI X SI SimpleMotorFF Calculate.vi public double calculate(double velocity, double acceleration) SimpleMotorFF_CalculateVelocityOnly.vi public double calculate(double velocity) X X X X SimpleMotorFF Ka AutoTune.vi SimpleMotorFF_MaxAchieveAccel.vi public double maxAchievableAcceleration(double maxVoltage, $X \mid X$ Χ double velocity) XX X SimpleMotorFF MaxAchieveVel.vi public double maxAchievableVelocity(double maxVoltage, double acceleration) XX Χ SimpleMotorFF_MinAchieveAccel.vi public double minAchievableAcceleration(double maxVoltage, double velocity) SimpleMotorFF MinAchieveVel.vi XX Χ public double minAchievableVelocity(double maxVoltage, double acce<u>leration)</u> SimpleMotorFF New.vi public SimpleMotorFeedforward(double ks, double kv, double ka) Χ X X SI SimpleMotorFF Pack Ka Tune Params.vi $X \mid X \mid X \mid X \mid SI$ public SimpleMotorFeedforward(double ks, double kv) '======== GEOMETRY '======== Function Prototype Notes COORDINATE AXIS X X X SI CoordAxis D.vi CoordAxis_E.vi $X \mid X$ X SI X SI CoordAxis N.vi XX X SI CoordAxis New.vi XX X SI CoordAxis S.vi X SI CoordAxis_U.vi $X \mid X$ XX X SI CoordAxis W.vi Function Prototype Notes COORDINATE SYSTEM X X X X SI X X SI CoordSystem Convert Pose3d.vi CoordSystem_Convert_Rotation3d.vi XX X SI CoordSystem_Convert_Translation3d.vi CoordSystem_Convert_Transform3d.vi $X \mid X$ X SI X SI X CoordSystem EDN.vi X SI X X SI X CoordSystem NED.vi CoordSystem_New.vi XX X SI X CoordSystem NWU.vi Function Prototype Notes POSE2D Pose2d_Div.VI $X \mid X$ X SI XX X SI Pose2d_Equals.VI boolean equals(other obj) X Pose2d Exp.vi pose2d exp(twist2d twist) X SI XX Pose2d_getRotation.vi rotation2d getRotation() can also use cluster unpack

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	Χ	Χ		X	SI		Pose2d_getTranslation.vi	translation2d getTranslation()	can also use cluster unpack			
-	X	X	X	X	SI		Pose2d_getXY.vi					
_	X	$\frac{X}{Y}$	Χ	X	SI		Pose2d_getXYAngle.vi					
		X	\longrightarrow	X	/ 		Pose2d_Interpolate.vi Pose2d_Log.vi	twist2d log(pose2d end)				
-		$\frac{\hat{x}}{X}$	-	X	<u> </u>		Pose2d Minus.vi	transform2d minus(pose2d other)				
-		\hat{x}	\longrightarrow	X	31		Pose2d New TRRO.vi	pose2d new(translation2d, rotation2d)				
	\hat{X}	\hat{x}		X	SI		Pose2d New.vi	pose2d new(translation2d, rotation2d) pose2d new(double x, double y, rotation2d)				
-		\hat{x}	\rightarrow	X	SI		Pose2d Plus.vi	pose2d plus(transform2d other)				
	X	$\frac{x}{x}$	\rightarrow	X	SI		Pose2d RelativeTo.vi	pose2d relativeto(pose2d other)				
	X	X	$\overline{}$	X	SI		Pose2d Times.vi	possed rolativoto(possed strior)				
		X	$\overline{}$	X	SI		Pose2d_TransformBy.vi	pose2d transformby(transform2d other)				
							_ /	pose2d new()	can use cluster constant			
					otimized	ram					6	
	mplemented	Documented	Not WPILIB	Item	o no	Test Routine Sample Prograi				e <i>vie</i> n	ıgran	
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г			_≥	_ <u>Š</u> _		- <u>7</u>	VI Name	Function Prototype	Notes	Š		
POSE3D		X		X	SI		Pose3d_Div.vi					
_		X		X	SI		Pose3d_Equals.VI					
_		X		X	X		Pose3d_Exp.vi					
-		X		X	SI		Pose3d_getRotation.vi					1
-	X	X	X	X	SI		Pose3d_getTranslation.vi					
_		X	X	X	51		Pose3d_getXYZ.vi Pose3d_Interpolate.vi					
-	X	\hat{x}		X	Y		Pose3d_Log.vi					
-		\hat{x}	\longrightarrow	X	<u>^</u>		Pose3d Minus.vi					
-		$\stackrel{\wedge}{X}$	-+	X	SI		Pose3d New.vi					
-		X	-	X	SI		Pose3d New Default.vi					
		\overline{X}	$\overline{}$	X	SI		Pose3d New Pose2d.vi					
F		X	$\overline{}$	X	SI		Pose3d New Trans3dRot3d.vi					
		X	$\overline{}$	X	SI		Pose3d Plus.vi					
		X		X	SI		Pose3d RelativeTo.vi					
		X		No	SI		Pose3d RotationVectorToMatrix.vi					
		Χ		X	SI		Pose3d_ToPose2d.vi					
	X	Χ		Χ	SI		Pose3d_Times.vi					
	X	Χ		Χ	SI		Pose3d_TransformBy.vi					
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	3e	nei	WPILI	Item	ecution	Rou ple f				Re	õ	
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_	_	٦	_ <	Ž	Щ	Sa	VI Name	Function Prototype	Notes	ပိ		
QUATERNION		Χ		X	SI		Quaternion_Equals.vi					
_		X		Χ			Quaternion_Get_All.vi					
-		X	\longrightarrow	X	SI		Quaternion_Get_LVQuat.vi					
-		X		X	SI		Quaternion_Get_Vect.vi					
-		X		X	SI		Quaternion_Get_W.vi					
-		X		X			Quaternion_Inverse.vi					
-		X	\longrightarrow	X	SI		Quaternion_New.vi					
_		X	\longrightarrow	X	SI		Quaternion_New_Default.vi					
		X	\longrightarrow	X			Quaternion_New_LVQuat.vi					
		X		X			Quaternion_Normalize.vi Quaternion Plus.vi					
-		$\frac{\lambda}{X}$	\longrightarrow	X			Quaternion_Flus.vi Quaternion_Times.vi					
-		\hat{x}	\longrightarrow	X			Quaternion_rimes.vi Quaternion_ToRotationVector.vi					
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	7	Documented			ŏ	Fest Routine Sample Prog						

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ROTATION2	D X	X

ield	Displa	ıy							
X	X		Χ	SI		Rotation2d_CreateAngle.vi	rotation2d new(double value)		
Χ	X		Χ	SI		Rotation2d_CreateAngleDegrees.vi	rotation2d fromDegrees(double degrees)	convert to radians then create	
Χ	X		Χ	SI		Rotation2d_CreateAngleRotations.vi			
X	X		Χ	SI		Rotation2d_CreateXY.vi	rotation2d new(double x, double y)		
X	X		Χ	SI		Rotation2d_Div.vi			
X	X		Χ	SI		Rotation2d_Equals.vi	boolean equals(rotation2d other)		
X	X	X	Χ	SI		Rotation2d_GetAngleCosSin.vi		New 1/26/21	
X	X		Χ	SI		Rotation2d_GetCos.VI	double getCos()	use cluster unpack	
Χ	X		X	SI		Rotation2d_GetDegrees.VI	double getDegrees()	use cluster unpack, then convert to	
								degree	
<i>X</i> _	X		Χ	SI		Rotation2d_GetRadians.VI	double getRadians()	use cluster unpack	
X	X		X	SI		Rotation2d_GetRotations.vi			
X	X		Χ	SI		Rotation2d_GetSin.VI	double getSin()	use cluster unpack	
X	X		Χ	SI		Rotation2d_GetTan.VI	double getTan()	can calculate	
(X		Χ	SI		Rotation2d_Interpolate.vi			
(X		Χ	SI		Rotation2d_Minus.vi	rotation2d minus(rotation2d other)		
(X		Χ	SI		Rotation2d_Plus.vi	rotation2d plus(rotation2d other)		
X	X		Χ	SI		Rotation2d_RotateBy.vi	rotation2d rotateby(rotation2d other)		
X	X		X	SI		Rotation2d_Times.vi	rotation2d times(double scalar)		
Χ	X		Χ	SI		Rotation2d_UnaryMinus.vi	rotation2d unaryminus()		
							rotation2d new()	can use cluster constant	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
ROTATION3D	Χ	Χ		Χ	SI		Rotation3d_Create_AxisAngle.vi					
	Χ	X		X	SI		Rotation3d_Create_Default.vi					
	Χ	Χ		Χ	SI		Rotation3d_Create_Quaternion.vi					
	Χ	X		Χ	1	_	Rotation3d_Create_InitialFinalVector.vi					
	Χ	Χ		Χ	SI		Rotation3d_Create_RollPitchYaw.vi					
	Χ	Χ		Χ	1		Rotation3d_Create_RotMatrix.vi					
	Χ	Χ		Χ	SI		Rotation3d_Div.vi					
	Χ	Χ		Χ	SI		Rotation3d_Equals.vi					
	Χ	X	X	Χ	SI		Rotation3d_GetAxisAngle.vi					
	Χ	X		Χ	SI		Rotation3d_GetQuaternion.vi					
	Χ	X		Χ	SI		Rotation3d_GetXYZ.vi					
	Χ	X		X	SI		Rotation3d_Interpolate.vi					
	Χ	Χ		X	SI		Rotation3d_Minus.vi					
	Χ	Χ		X	SI		Rotation3d_Plus.vi					
	Χ	Χ		X	SI		Rotation3d_RotateBy.vi					
	Χ	X		X	SI		Rotation3d_Times.vi					
	Χ	X		X	SI		Rotation3d_ToRotation2d.vi					
	Χ	X		X	SI		Rotation3d_UnaryMinus.vi					

TRANSFORM2D	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optii	Test Routine	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
M2D	X	Χ		X	SI		Transform2d Create PosePose.vi	transform2d new(pose2d, pose2d)				
	X	X		X	SI		Transform2d_Create_TransRot.vi	transform2d new(translation2d, rotation2d)				
	X	Χ		Χ	SI		Transform2d_Div.vi					
	X	X		X	SI		Transform2d_Equals.VI	boolean equals(other transform2d)				
	X	Χ		Χ	SI		Transform2d_GetRotation.VI	rotation2d getRotation()	use cluster unpack			
	X	Χ		X	SI		Transform2d_GetTranslation.VI	translation2d getTranslation()	use cluster unpack			
	X	Χ	X	Χ	SI		Transform2d_GetXY.vi					
	Χ	Χ	X	Χ	SI		Transform2d_GetXYAngle.vi					
	X	Χ		X	SI		Transform2d_Inverse.vi	transform inverse()	new			
	X	Χ		X	Si		Transform2d_Plus.vi					
	Χ	Χ		Χ	SI		Transform2d_Times.vi	transform2d times(double scalar)				
								transform2d new()	can use cluster constant			

Revision 3.07 3/20/2023 – Updated Ramsete Execute,, added Field Display VI Name Function Prototype Notes TRANSFORM3D XX X SI Transform3d Create Default.vi $X \mid X$ X SI Transform3d Create Pose3dPose.3dvi Transform3d Create Trans3dRot3d.vi $X \mid X$ X SI Transform3d Div.vi X X X SI Transform3d Equals.VI X SI X SI Transform3d GetRotation3d.VI XX X SI Transform3d GetTranslation3d.VI Transform3d GetXYZ.vi X X X X SI XX Transform3d Inverse.vi X SI X Si Transform3d Plus.vi XX X SI Transform3d Times.vi Function Prototype Notes TRANSLATION2D X X Translation2d Create DistAng.vi X SI Translation2d_Create.vi X SI translation2d new(double x, double y) $X \mid X$ Translation2d Div.vi SI XX X SI Translation2d Equals.vi boolean equals(translation other) XX X SI Translation2d GetAngle.vi X SI Translation2d GetDistance.vi double getDistance(translation2d other) $X \mid X$ X SI X SI can use cluster unpack Translation2d GetNorm.VI double getNorm() XX Translation2d GetX.VI double getX() can use cluster unpack X X X X SI Translation2d GetXY.VI X SI Translation2d GetY.VI double getY() can use cluster unpack Translation2d_Interpolate.vi XX X SI XX X SI Translation2d Minus.vi translation2d minus(translation2d other) X SI XX Translation2d Plus.vi translation2d plus(translation2d other) XX X SI Translation2d RotateBy.vi translation2d rotateBy(rotation2d other) Translation2d_Times.vi translation2d times(double scalar) XX X SI Translation2d UnaryMinus.vi translation2d unaryminus() X SI translation2d new() can use cluster constant translation2d div(double scalar) can multiply by 1/scalar Function Prototype Notes TRANSLATION3D X X X SI Translation3d Create.vi Translation3d_Create_Default.vi $X \mid X$ X SI Translation3d Create_DistAng.vi X X X SI X SI Translation3d Div.vi XX X SI Translation3d Equals.vi X X X SI Translation3d GetDistance.vi X SI Translation3d GetNorm.VI $X \mid X$ X X X X SI X X X SI Translation3d GetXYZ.vi Translation3d Interpolate.vi Translation3d Minus.vi XX X SI XX X SI Translation3d Plus.vi Translation3d_RotateBy.vi $X \mid X$ X SI X SI X SI Translation3d Times.vi X X Translation3d ToTranslation2d.vi XX X SI Translation3d UnaryMinus.vi

	прІетеп	Document	Not WPILI	Menu Iter	Execution Test Routi	E	Founding Dealsham	Neter	Code Rev	est Progi	rror Chec
TWIST2	א אם <u>צ</u>	<u> X </u>	_ <		SI E	の VI Name Twist2d Create.vi	Function Prototype twist new(x, y, theta)	Notes		<u> </u>	Ш
	X	X		X	SI	Twist2d_Equals.VI	boolean equals(obj other)				
	X	X	X	X	SI	Twist2d_GetAll.VI					
TWIST3	X X Implemented	X	X Not WPILIB	X	Signature Optimized X X X X Test Routine	VI Name Twist3d_Create.vi Twist3d_Equals.VI	Function Prototype	Notes	Code Review	Test Program	Error Checking
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	<u>tu</u>	Q	Not	Mer			Function Prototype	Notes	Š	7e.	Em
CHASSIS SPEED		X			SI	ChassisSpeeds_FromFieldRelativeChassisSpeeds.VI	abassisan and from Field Deletive Chande/ devible v. devible v.				
	X	X			SI	ChassisSpeeds_FromFieldRelativeSpeeds.VI	chassisspeeds fromFieldRelativeSpeeds(double x, double y, double angvel, rotation2d robotangle)				
	Χ		X	Χ	SI	ChassisSPeeds_GetXYOmega.vi					
	X	X		Χ	SI	ChassisSpeeds_New.vi	chassisspeeds new (double xvel, double yvel, double angvel)				
							chassisspeeds new ()	can use cluster constant			
	nplemented	Documented	Vot WPILIB	enu Item	Execution Optimized Test Routine	Sample Program			ode Review	est Program	rror Checking
DIFFERENTIAL DRIVE KINEMATIC	s X	<u>Д</u>	_ <	_ <u>≷</u> X	<u>й</u> Е		Function Prototype diffDriveKine new(double trackWidth)	Notes	8	<u> </u>	<u> </u>
DITTEREMENT DITTERMENT	X	X		X	XX	DiffKinematics_toChassisSpeed.vi	chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds)				
	X	X		Χ	SI	DiffKinematics ToTwist2d.vi					
	X	X		Χ	SI X	DiffKinematics_toWheelSpeed.vi	diffDriveWheelSpeed toWheelSpeeds(chassisSpeeds)				
	nplemented	Documented	Not WPILIB	1enu Item	Execution Optimized Test Routine	Sample Program electric Name	Function Prototyne	Netoo	Code Review	est Program	iror Checking
DIFFERENTIAL DRIVE ODOMETRY	<u>۽</u> ر	٩	X		H F	ツ VI Name DiffOdometry_Execute.vi	Function Prototype	Notes DONT NEED	U U	7	Ü
DILL ENERTIAL DRIVE ODDINETRI	X	X	^	Х	Χ	DiffOdometry_Update.vi	pose2d update(rotation2d gyro, double leftdist, double right dis				
						7 V=11		, , , , , , , , , , , , , , , , , , , ,			
							diffDrOdom new(rotation gyro, pose initial) diffDrOdom new(rotation gyro)				
							void resetPosition(pose2d, rotation2d)	incorporated into "update"			
							pose2d getPoseMeters()	, , , , , , , , , , , , , , , , , , , ,			

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optim	Test Routine Sample Program awa IA	Function Prototype	Notes	Code Review	Test Program	Error Checking
MECANUM DRIVE ODOMETRY			X			MecaOdometry_Execute.vi					
	X	Χ	X	X	X	MecaOdometry_GetKinematics.vi					
	X	Χ		Χ		MecaOdometry_GetPose.vi					
	X	Χ		Χ		MecaOdometry_New.vi					
	X	Χ		Χ		MecaOdometry_NewDefaultPose.vi					
	X	Χ		Χ		MecaOdometry_Reset.VI					
	X	Χ		Χ		MecaOdometry_Update.vi					
						MecaOdometry UpdateWithTime.vi		Removed			

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public SwerveDriveOdometry(SwerveDriveKinematics kinematics, X SwerveOdometry_NewZeroCenter.VI X Rotation2d gyroAngle) $X \mid X$ X SI SwerveOdometry ResetPosition.VI public void resetPosition(Pose2d pose, Rotation2d gyroAngle) SwerveOdometry_Update4.VI X X X X For 4 module drives SwerveOdometry_UpdateWithTime4.VI REMOVED REMOVED SwerveOdometry_UpdateWithTimeX.VI 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)

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private SimpleMatrix makeHermiteBasis()

QuinticHermiteSpline_makeHermiteBasis.vi

	Χ	Displa X	ĺ	X			QuinticHermiteSpline_New.vi	public QuinticHermiteSpline(double[] xInitialControlVector,				
								double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector)				İ
								protected SimpleMatrix getCoefficients()	not needed, use cluster unpack			
	Þ	ā			Optimized	g.	Program			Me	E.	cking
	Implemented	Documented	Not WPILIB	Menu Item		Test Routine	ole Pro			Review	Progra	Che
	e)du	Docu	Vot 1	Wenu	Exec	Test	ର ମ Name ଜୁନ	Function Prototype	Notes	Code	Fest	Error
LINE (Abstract class)				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			<u> </u>
	mplemented	Documented	Vot WPILIB	Menu Item	ion Optimized	Test Routine	e Program			Code Review	rogram	Checking
	olen	uno	t W	n l	Execution	st R	S VI Name			de F	st P	o,
	_		Ñ			7es	S VI Name	Function Prototype	Notes	Š		Em
SPLINE HELPER	X	X		X		X	SplineHelp_GetCubicCtrlVector.vi SplineHelp_GetCubicCtrlVectorsFromWayPts.vi	private static Spline.ControlVector getCubicControlVector(double scalar, Pose2d point) public static Spline.ControlVector[]				
								getCubicControlVectorsFromWaypoints(Pose2d start, Translation2d[] interiorWaypoints, Pose2d end)				
	X	X					SplineHelp_GetCubicCtrlVectorsFromWeightedWayPts.vi		intownal			-
	X	X		No No			SplineHelp_GetCubicSpline_Calc1.vi SplineHelp_GetCubicSpline_Calc2.vi		internal internal			
	$\frac{\lambda}{X}$	X		No			SplineHelp GetCubicSpline Calc3.vi		internal			
	X	X		X		X	SplineHelp_getCubicSplinesFromControlVectors.vi	public static CubicHermiteSpline[] getCubicSplinesFromControlVectors(Spline.ControlVector start, Translation2d[] wayveints, Spline ControlVector end)				
	Χ	Х		X	SI		SplineHelp_GetQuinticCtrlVector.vi	Translation2d[] waypoints, Spline.ControlVector end) private static Spline.ControlVector getQuinticControlVector(double scalar, Pose2d point)				
							SplineHelp_GetQuinticCtrlVectorsFromWayPts.vi	public static List <spline.controlvector> getQuinticControlVectorsFromWaypoints(List<pose2d> waypoints)</pose2d></spline.controlvector>	REMOVED 2762			
							SplineHelp_GetQuinticCtrlVectorsFromWeightedWayPts.vi		REMOVED 2762			
	X	X		X			SplineHelp_getQuinticSplinesFromControlVectors.vi	<pre>public static QuinticHermiteSpline[] getQuinticSplinesFromControlVectors(Spline.ControlVector[] controlVectors)</pre>				
	Χ	X	X	X			SplineHelp_GetQuinticSplinesFromWeightedWayPts.vi	, <u> </u>	New 2762			
	X	X		X			SplineHelp_GetQuinticSplinesFromWayPts.vi		New 2762			
	X	X		No			SplineHelp_ThomasAlgorithm.vi	private static void thomasAlgorithm(double[] a, double[] b, double[c, double[] d, double[] solutionVector)	Jinternai			
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program			Code Review	st Program	
			_ ≥					Function Prototype	Notes	ပိ	Test	ů
NE PARAMETERIZER	<i>X</i>	X		X			SplineParam_Spline_T0_T1.vi	public static List <posewithcurvature> parameterize(Spline spline double t0, double t1)</posewithcurvature>				
	X	Х		X		X		public static List <posewithcurvature> parameterize(Spline spline</posewithcurvature>)			
	Χ	X	X	No			SplineParam_StackGet.vi		internal			
	X		X	No	1	- 1	SplineParam_StackPop.vi		internal	1	I	1

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

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			ຸ ≥			9	Sa	VI Name	Function Prototype	Notes	_ၓ	76	<u> </u>
TRAJECTORY				X				Trajectory_Concatenate.vi					
	X			X	SI			Trajectory_equals.vi Trajectory GetStates.vi	boolean equals(other obj)	FUTURE not needed, use unpack			
	X			X				Trajectory_GetStates.vi Trajectory_GetTotalTime.vi	public List <state> getStates() public double getTotalTimeSeconds()</state>	not needed, use unpack			
	\hat{x}			No	SI			Trajectory_lerp_double.vi	private static double lerp(double startValue, double endValue,	internal			
		^		''	0,			Trajostory_torp_usuble.tr	double t)	internal			
	X	X		No	SI			Trajectory_lerp_Pose.vi		internal			
	· ·	X		\ \ \	SI			Taria dama Nassa Farantsasi	double t)				
		X		X	SI			Trajectory_New_Empty.vi Trajectory_New.vi	public Trajectory(final List <state> states)</state>				
		$\frac{\lambda}{X}$		X				Trajectory_RelativeTo.vi	public Trajectory relativeTo(Pose2d pose)				
	X			X				Trajectory_Sample.vi	public State sample(double timeSeconds)				
	X		X	X				Trajectory_SampleReverse.vi		Sample in reverse order. Negate			
										sample.			
	X	X		X				Trajectory_TransformBy.vi	public Trajectory transformBy(Transform2d transform)				
									public Pose2d getInitialPose()	can use cluster unpack, array index			
				-									
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	Ξ.						Sa	VI Name	Function Prototype	Notes	ပိ	Test	<u>E</u>
TRAJECTORY_STATE	X	X		X	SI			TrajectoryState_Equals.vi	boolean equals(other obj)				
		X	X	X	SI			TrajectoryState_GetAll.vi					
	X			X	SI			TrajectoryState_GetPose.vi	Obeta intermediate (Otata and Malura devolute i)				
	X			X				TrajectoryState_Interpolate.vi TrajectoryState_New.vi	State interpolate(State endValue, double i) public State(double timeSeconds, double				
	^	^		^	31			TrajectoryState_New.vi	velocityMetersPerSecond, double				
									accelerationMetersPerSecondSq, Pose2d poseMeters, double				
									curvatureRadPerMeter)				
									public State()				
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	plemented	Documente	₹	Menu Item	Execution	Test Routir	Sample				Code		O.
		Ğ	Not		Ě	e	Sa	VI Name	Function Prototype	Notes	ပိ	Test	<u> </u>
TRAJECTORY CONFIG	X	X		X				TrajectoryConfig_AddConstraint.vi	public TrajectoryConfig addConstraint(TrajectoryConstraint	Implemented differently, can't	T		
	~	X		X				Trajectory/Config. Add/Constraints 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			
	^	^		_ ^				TrajectoryConfig_AddConstraints.vi	TrajectoryConstraint> constraints)	duplicate.			
	X	X		X	SI			TrajectoryConfig_Create.vi	public TrajectoryConfig(double maxVelocityMetersPerSecond.				
	L								double maxAccelerationMetersPerSecondSq)				
	X		 	X	-			TrajectoryConfig_GetCentripetalAccel.vi		1 1 1175			
	X	X	X	X				TrajectoryConfig_GetConstraints.vi	public List <trajectoryconstraint> getConstraints()</trajectoryconstraint>	Implemented differently, can't duplicate.			
	X	X	+	X				TrajectoryConfig_GetEndVelocity.vi	public double getEndVelocity()	can use cluster unpack			
	X			X				TrajectoryConfig GetKinematicsDiffDrive.vi	3,(/				
	X	X		X				TrajectoryConfig_GetKinematicsMecanumfDrive.vi					
	X			X				TrajectoryConfig_GetKinematicsSwerveDrive.vi					
	X				_			TrajectoryConfig_GetMaxVelAccel.vi					
	X			X				TrajectoryConfig_GetStartVelocity.vi	public double getStartVelocity()	can use cluster unpack			
	X	X	-	X	-			TrajectoryConfig_GetVoltageDiffDrive.vi	public boolean is Payores d/\	can use cluster uppeak			
	X		X		SI			TrajectoryConfig_IsReversed.vi TrajectoryConfig_setCentripetalAccel.vi	public boolean isReversed()	can use cluster unpack			
	X		+^	X	31			TrajectoryConfig_SetCentripetalAccet.vi TrajectoryConfig_SetEndVelocity.vi	public TrajectoryConfig setEndVelocity(double				
	_^	⊥^		⊥^					endVelocityMetersPerSecond)				
	X	X		X	SI			TrajectoryConfig_setKinematicsDiffDrive.vi	public TrajectoryConfig setKinematics(DifferentialDriveKinematics				
		V		\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	-			Tunicateur Config. activinamentian Na	kinematics)	_			
	X	X		X	SI			TrajectoryConfig_setKinematicsMecanumfDrive.vi	public TrajectoryConfig setKinematics(MecanumDriveKinematics kinematics)				
		1		-	-			ı	,				

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	X	X		X S	6/		TrajectoryConfig_setKinematicsSwerveDrive.vi	public TrajectoryConfig setKinematics(SwerveDriveKinematics kinematics)				
	X	\times		X S	SI		TrajectoryConfig_setReversed.vi	public TrajectoryConfig setReversed(boolean reversed)				+
	X	X		X			TrajectoryConfig_SetStartVelocity.vi	public TrajectoryConfig setStartVelocity(double startVelocityMetersPerSecond)				
	Y	X	Y	y (21		TrajectoryConfig_setVoltageDiffDrive.vi	start velocity meters Per Second)				+
	^	^	^	^	"		Trajectory Cornig_set voltage Dili Drive. vi	public double getMaxVelocity()	Created function to return both			+-
								public double getMaxAcceleration()	Created function to return both			_
L								NOTE ADD OTHER "SET" ROUTINES FOR OTHER	or output familiaries to rotain 2011			
								CONTRAINTS HERE, SINCE NEW CONTRAINTS ARE SPECIFIC AND NOT GENERIC.				
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	ted	pə;	9	_ (3 3	ğ				iew	Program	
	en	eni	WPILIB	ten		9				SeV.	,ba	
	lem	En	Š	2						e L	<u>q</u>	
	ldμ	ŏ	ŏ	ω .	-	Sam	VI Name	Function Prototype	Notes	Code	Test	
TRAJECTORY GENERATE	<u> </u>	X		<u>≥ ι</u>	<u> </u>	<u>, ν</u>	TrajectoryGenerate Make Cubic CtrlVect.vi	public static Trajectory generateTrajectory(Spline.ControlVector		U		Т
TRAJECTORT GENERALE								initial, List <translation2d> interiorWaypoints, Spline.ControlVector</translation2d>	or			
	X	X		X			TrajectoryGenerate_Make_Cubic.vi	end, TrajectoryConfig config) public static Trajectory generateTrajectory(Pose2d start, List <translation2d> interiorWaypoints, Pose2d end, TrajectoryConfig config)</translation2d>	uses cubic splines			
	X	X	X	X			TrajectoryGenerate Make Generic.vi	Helper to bring these all together	Use this one!!!			
	X	X		X			TrajectoryGenerate_Make_Quintic_CtrlVect.vi	public static Trajectory generateTrajectory(ControlVectorList controlVectors, TrajectoryConfig config)	uses quintic splines			
								controlVectors, TrajectoryConfig config)				
				X			TrajectoryGenerate_Make_Quintic_Weighted.vi		New 2762			
	X	X		X			TrajectoryGenerate_Make_Quintic.vi	public static Trajectory generate Trajectory (List <pose2d></pose2d>	uses quintic splines			
	~	X		x			TrajectoryGenerate splinePointsFromSplines.vi	waypoints, TrajectoryConfig config) public static List <posewithcurvature></posewithcurvature>				+
	X	^		^			TrajectoryGenerate_splineFolitisFromSplines.vi	splinePointsFromSplines(Spline[] splines)				
	lemented	sumented		u Item	cation Optim.	nple Program				de Review	t Program	
	ldu	000	0ţ	lenu	, d	Sam	VI Name	Function Prototype	Notes	Cod	Test	
TRAJECTORY GENERATE (Control Vector)	Σ.	Δ	<	ڪ ل	<u> </u>	. v	vi name	public ControlVectorList(int initialCapacity)	may not need, just data			_
TRAJECTORT GENERATE (CONTION VECTOR)								public ControlVectorList()	may not need, just data			+
								public Control vector List() public Control Vector List(Collection extends</td <td>may not need, just data</td> <td></td> <td></td> <td>+-</td>	may not need, just data			+-
l								Spline.ControlVector> collection)	may not need, just data			
				1	Dezili	8						
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TRAJECTORY PARAMETERIZE			X I				TrajectoryParam_calcStuffFwd.vi					_
	_		X I	_			TrajectoryParam_calcStuffRev.vi					_
	X	X		Vo			TrajectoryParam_enforceAccel.vi	private static void enforceAccelerationLimits(boolean reverse, List <trajectoryconstraint> constraints, ConstrainedState state)</trajectoryconstraint>	This routines needs to be changed when new constraints are added.			\perp
	X		X	Vo X			TrajectoryParam_enforceVelocity.vi TrajectoryParam_timeParam.vi	public static Trajectory	This routines needs to be changed when new constraints are added.			1
	^	^		^			majectory raram_umeraram.vi	public static Trajectory timeParameterizeTrajectory(List <posewithcurvature> points. List<trajectoryconstraint> constraints, double startVelocityMetersPerSecond, double endVelocityMetersPerSecond, double</trajectoryconstraint></posewithcurvature>				

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72023 – Opualeu Namsele Execute,, audeu	i iciu	Dispic	чу		7-				
	mplemented	Documented	ot WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program		
DIFF DRIVE KINEMATIC CONSTRAINT		X	Not	X	_ Û	7	VI Name DiffDriveKinematicsConstraint_getMaxVelocity.vi	Function Prototype public double getMaxVelocityMetersPerSecond(Pose2d	Notes
DIT DRIVE RINEWATIO CONCTRAINT								poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X			DiffDriveKinematicsConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X	SI		DiffDriveKinematicsConstraint_New.vi	public DifferentialDriveKinematicsConstraint(final DifferentialDriveKinematics kinematics, double maxSpeedMetersPerSecond)	
	mplemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program		Notes
DIFF DRIVE VOLTAGE CONSTRAINT	_ =	X	_ <	X		1	ツ VI Name DiffDriveVoltageConstraint_getMaxVelocity.vi	Function Prototype public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	Notes
	X	Х		X			DiffDriveVoltageConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X	SI		DiffDriveVoltageConstraint_New.vi	public DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	
ELLIPTICAL REGION CONSTRAINT	X X / Implemented	X X Documented	Not WPILIB	X X Menu Item	Execution Optimized	Test Routine	VI Name EllipRegionConstraint_getMaxVelocity.vi EllipRegionConstraint_getMinMaxAccel.vi EllipRegionConstraint_lsPoseInRegion.vi EllipRegionConstraint_New.vi	Function Prototype	Notes
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program Name	Function Prototype	Notes
JERK CONSTRAINT	/		X				JerkConstraint_getMaxVelocity.vi JerkConstraint_getMinMaxAccel.vi	Routine exists, it is just a shell Routine exists, it is just a shell	FUTURE FUTURE
	/		X		SI		JerkConstraint_New.vi	Routine exists, it is just a shell	FUTURE
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Nample Program	Function Prototype	Notes
MAX VELOCITY CONSTRAINT	X	X		X	SI SI		MaxVelocityConstraint_getMaxVelocity.vi MaxVelocityConstraint_getMinMaxAccel.vi		
	X	X		X			MaxVelocityConstraint_SetwiniwaxAccer.vi		

Constraint MinMax New

'===== UTILITY

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

FRC_LabVIEW_Trajectory_Library_Routines.xlsx

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Constraint MinMax NewMinMax.VI

auueu	Implemented	Documented d	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program			
							Sar	VI Name	Function Prototype	Notes
UTIL	Χ	X	Χ	Χ	SI			Util_ApproxEqual.vi		
	Χ	X	Χ	Χ				Util_Array_PoseWCurv_to_XY.vi		
	Χ	Χ	Χ	Χ	SI			Util_CalcDist.vi		
	Χ	X	Χ	Χ	SI			Util_GetLibraryVersion.vi		
	Χ	X	Χ	Χ	SI			Util_GetLibUsage.vi		
	X	X	X	X				Util_GetTime.vi		Once tested completely, this should be optimized!
	Χ	X	Χ	No	1			Util_GetTime_U32.vi		
	Χ	X	Χ	No	I			Util_GetTime_U64.vi		
	Χ	X	Χ	No	N/A			Util_LibraryGlobals.vi		Global Variables – no block diag.
	Χ	X	Χ	Χ				Util_Trajectory_Absolute_To_Relative.vi		
	X	X	Χ	Χ				Util_Trajectory_ReadFile.vi		
	X	X	Χ	X				Util_Trajectory_to_XY.vi		
	Χ	X	Χ	No				Util_Trajectory_WriteFile_Config.vi		internal
	Χ	X	Χ	No				Util_Trajectory_WriteFile_OneState.vi		internal
-	Χ	Χ	Χ	Χ				Util_Trajectory_WriteFile_PathFinder.vi		
	X	X	Χ	No				Util_Trajectory_WriteFile_PathFinderConfig.vi		internal
	X	X	Χ	Χ				Util_Trajectory_WriteFile_Pathweaver.vi		
	X	X	Χ	No				Util_Trajectory_WriteFile_States.vi		internal
	Χ	X	Χ	No				Util_Trajectory_WriteFile_WayPoints.vi		internal
-	Χ	X	Χ	Χ				Util_Trajectory_WriteFile.vi		
	Χ	Χ	Χ	X				Util_TrajectoryState_Meters_To_Inches.vi		
	X	X	Χ	Χ				Util_TrajState_to_DiffDrive_WheelPos.vi		
	Χ	X	Χ	X				Util_DispWaypoint_Eng_To_SI.vi		
	Χ	X	Χ	Χ				Util_DispWaypoint_To_CubicInput.vi		
	Χ	X	Χ	Χ				Util_DispWaypoint_To_QuinticInput.vi		
	X	X	Χ	Χ				Util_DispWeightedWaypiont_Eng_To_WeightedWaypoint		
	Χ	X	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		Function Prototype	Notes
CONV	Χ	Χ	Χ	Χ	SI			Conv_AngleDegrees_Heading.vi		
	Χ	Χ	Χ	Χ	SI			Conv_AngleRadians_Heading.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Centimeters_Meters.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Deg_Radians.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Deg_Rotations.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Feet_Meters.vi		
	Χ	Χ	Χ	Χ	SI			Conv_GyroDegrees_Heading.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Heading_AngleRadians.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Inches_Meters.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Kilograms_Pounds.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Meters_Feet.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Meters_Inches.vi		
	X	Χ	Χ	Χ	SI			Conv_Pose2d_SI_Eng.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Pounds_Kilograms.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Radians_Deg.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Radians_Rotations.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Rotations_Deg.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Rotations_Radians.vi		
Į	X	X	Χ	X	SI			Conv_Yards_Meters.vi		

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

'======== PATHFINDER UTIL

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

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

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimize	Test Routine	Sample Program Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DC MOTOR	Χ	X		Χ	SI		DCMotor_GetAndymark9015.vi					
	Χ	X		Χ	SI		DCMotor_GetAndymarkAM2235A.vi					
	Χ	X		Χ	SI		DCMotor_GetAndymarkAM3493.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		Χ	SI		DCMotor_GetSpeed.vi					
	Χ	X		Χ	SI		DCMotor_GetTorque.vi					
	Χ	X		Χ	SI		DCMotor_GetVex775Pro.vi					
	Χ	X		Χ	SI		DCMotor_New.vi					
	Χ	X		Χ	SI		DCMotor_PickMotor.vi					
	Χ	X		Χ	SI		DCMotor_WithReduction.vi					

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L			$\perp \perp \perp$						<u>i</u>
LINEAR SYSTEM ID	X X X X X X X X X X X X X X X X X X X	X	X	S S S S S S S S S S	Sam	/I Name	Code Review	Test Program	Error Checking
	X X X X X X X X X X X X X X X X X X X	X	X X X			LinearSystemId_Elevator_Pack_Model_Params.vi LinearSystemId_FlyWheel_Pack_Model_Params.vi LinearSystemId_IdentifyDriveTrainSystem.vi LinearSystemId_IdentifyPositionSystem.vi LinearSystemId_IdentifyVelocitySystem.vi LinearSystemId_IdentifyVelocitySystem.vi LinearSystemId_SngJntArm_Pack_Model_Params.vi LinearSystemId_SngJntArm_Pack_Model_Params.vi			
===== SPACE ESTIMATION ======									
	Implemented Documented	Not WPILIB	Menu Item	Execution Optimized	Sam	/I Name Function Prototype Notes	Code Review	Test Program	Error Checking
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	X		$\frac{1}{\lambda}$	_		ExtendedKalmanFilter GetXHat Single.vi					
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Revision 3.07

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	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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	Χ	Χ		X				UnscentedKalmanFilter_Correct_OnlyUY.vi					
	Χ	Χ		X				UnscentedKalmanFilter_Correct_OnlyUYR.vi					
	Χ	Χ		X				UnscentedKalmanFilter_Correct.vi					
	Χ	Χ		X				UnscentedKalmanFilter_GetP_Single.vi					
	Χ	Χ		X				UnscentedKalmanFilter_GetP.vi					
	Χ	Χ		X				UnscentedKalmanFilter_GetXHat_Single.vi					
	Χ	Χ		X				UnscentedKalmanFilter_GetXHat.vi					
	X	Χ		X				UnscentedKalmanFilter_New_Default.vi					
	X	Χ		X				UnscentedKalmanFilter_New_FuncGroup.vi					
	Χ	Χ		X				UnscentedKalmanFilter_New.vi					
	X	Χ		X				UnscentedKalmanFilter_Predict.vi					
	Χ	Χ		X				UnscentedKalmanFilter_Reset.vi					
	Χ	Χ		X				UnscentedKalmanFilter_SetP.vi					
	Χ	Χ		X				UnscentedKalmanFilter_SetXHat_Single.vi					
	Χ	Χ		X				UnscentedKalmanFilter_SetXHat.vi					
	X	Χ		X				UnscentedKalmanFilter_Transform.vi					

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

CONTROL AFFINE PLANT INVERSION FEEDFORWARD	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program NI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Nample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE ACCELERATION LIMITER	X	X		X		X	DiffDrvAccelLimit_Calculate.vi DiffDrvAccelLimit_New.vi					
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Nample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
IMPLICIT MODEL FOLLOWER	X	X		X		Χ	ImplModelFollow_Calculate.vi					
	X	X		X		X X	ImplModelFollow_GetU.vi ImplModelFollow_GetU_Single.vi					
	X	X		X		\hat{x}	ImplModelFollow_New.vi					
	X	Χ		X		Χ	ImplModelFollow_New_Plant.vi					
	X	Χ		X		X	ImplModelFollow_Reset.vi					
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Revision 3.07 3/20/2023 – Updated Ramsete Execute,, added Field Display Function Prototype Notes LINEAR PLANT INVERSION FEEDFORWARD X X LinearPIntInvFF_Calculate_NextR.vi XX Χ LinearPIntInvFF Calculate.vi LinearPIntInvFF GetR Single.vi XX Χ LinearPIntInvFF_GetR.vi X X Χ XX LinearPIntInvFF GetUff Single.vi Χ LinearPIntInvFF GetUff.vi XX Χ LinearPIntInvFF New Plant.vi XX X LinearPIntInvFF New.vi LinearPIntInvFF Reset Initial.vi $X \mid X$ Χ XX Χ LinearPIntInvFF Reset Zero.vi Function Prototype Notes LINEAR QUADRATIC REGULATOR X X LinearQuadraticRegulator_Calculate_NextR.vi XX X LinearQuadraticRegulator Calculate.vi NOT ORIGINAL. XX LinearQuadraticRegulator_GetK_Single.vi X XX LinearQuadraticRegulator GetK.vi X X X X X X X LinearQuadraticRegulator GetR Single.vi LinearQuadraticRegulator_GetR.vi XX X LinearQuadraticRegulator GetU Single.vi XX LinearQuadraticRegulator_GetU.vi X LinearQuadraticRegulator_LatencyCompensate.vi Routine exists, but it only has XX X terger raise matrix to power. XX LinearQuadraticRegulator New ELMS.vi Χ LinearQuadraticRegulator_New_N.vi XX X LinearQuadraticRegulator New Raw.vi X X Χ LinearQuadraticRegulator_New_SystemELMS.vi XX Х LinearQuadraticRegulator_New.vi LinearQuadraticRegulator_Reset.vi $X \mid X$ Χ WPILIB VI Name Function Prototype Notes LINEAR SYSTEM X X LinearSystem CalculateX.vi LinearSystem_CalculateY.vi XX X SI LinearSystem_GetA.vi X SI LinearSystem_GetAElement.vi XX XX X SI LinearSystem GetB.vi XX X SI LinearSystem GetBElement.vi X SI LinearSystem GetC.vi XX X SI LinearSystem GetCElement.vi $X \mid X$ X SI LinearSystem GetD.vi LinearSystem_GetDElement.vi $X \mid X$ X SI X SI LinearSystem New.vi XX

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LINEAR SYSTEM LOOP		X		Χ			nearSystemLoop_ClampInput.vi				
	X	X		X			nearSystemLoop_Correct.vi				
	X	X	X	X	CI		nearSystemLoop_DCMotor_Execute.vi nearSystemLoop_DCMotor_Pack_Ctrl.vi				+
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	X				SI		nearSystemLoop_DiffDrv_Pack_Ctrl.vi		+		+
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	Χ		X	Χ	SI		nearSystemLoop_Elevator_Pack_Ctrl.vi				
			X				nearSystemLoop_Execute.vi				
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							nearSystemLoop_New_LinearSystem_ClampFunc				
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ļ			X				TVDiffDriveCtrl_Pack_Ctrl_Params.vi				_
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Revision 3.07 3/20/2023 – Updated Ramsete Execute,, added Field Display

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Revision 3.07 3/20/2023 – Updated Ramsete Execute,, added Field Display XX LinearSystemSim Setstate.vi XX X LinearSystemSim_Update.vi XX LinearSystemSim UpdateX.vi No X X X No LinearSystemSim UpdateY.vi Function Prototype SINGLE JOINT ARM SIM X SngJntArmSim EsitmateMOI.vi X X X X SngJntArmSim Execute.vi SngJntArmSim_GetAngleRads.vi XX X SngJntArmSim_GetCurrentDraw.vi XX X X X X X Χ SngJntArmSim_GetVelocityRadsPerSec.vi SngJntArmSim HasHitLowerLimit.vi XX Χ SngJntArmSim_HasHitUpperLimit.vi XX Х SngJntArmSim New.vi X X X X SI SngJntArmSim Pack Simulation Params.vi SngJntArmSim Rkf45 Func.vi XX No XX Χ SngJntArmSim_SetInputVoltage.vi XX X SngJntArmSim_SetState.vi XX X SngJntArmSim Update.vi XX Χ SngJntArmSim UpdateX.vi SngJntArmSim_WouldHitLowerLimit.vi $X \mid X$ Χ X SngJntArmSim WouldHitUpperLimit.vi '======= MATRIX UTILITIES '======== VI Name Function Prototype Notes MAT BUILDER X X X SI MatBuilder Create.vi XX X SI MatBuilder Fill.vi Function Prototype Notes MATRIX X X Matrix_AssignBlock.vi X SI Matrix Block.vi $X \mid X$ X SI Matrix ChangeBoundsUnchecked.vi XX X SI Matrix Create.vi Matrix Det.vi XX X SI Matrix_Diag.vi Matrix Div Scalar.vi labview has function Matrix_ElementPower.vi XX X SI Matrix ElementSum.vi Matrix ElementTimes.vi Matrix_Equals.vi X X X I X SI Matrix Exp.vi Matrix_ExtractColumnVector.vi XX X SI Matrix ExtractFrom.vi Matrix ExtractMatrix.vi X X Matrix_ExtractRowVector.vi X SI X SI Matrix Fill.vi XX

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Revision 3.07 3/20/2023 – Updated Ramsete Execute,, added Field Display Function Prototype Notes X SI X Si VECTOR X X Vector Dot.vi XX Vector Norm.vi '======== MATH '======= Function Prototype Notes ANGLE STATISTICS X X X X X AngleStats AngleAdd CallbackHelp.vi AngleStats_AngleAdd.vi
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COMPUTER AX X X X X X X X X X X X X X X X X X X	VI Name CompVisionUtil_CalculateDistanceToTarget.vi CompVisionUtil_EstimateCameraToTarget.vi CompVisionUtil_EstimateFieldToCamera.vi CompVisionUtil_EstimateFieldToRobot.vi CompVisionUtil_EstimateFieldToRobot_Alt.vi CompVisionUtil_ObjectToRobotPose.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
Abull tem Not WPILIB Test Routine Sample Drougen Amenu Item Test Routine		Function Prototype	Notes	Code Review	Test Program	Error Checking
APRIL TAG FIELD LAYOUT X	VI Name AprilTagFieldLayout_GetField.vi AprilTagFieldLayout_GetOriginPosition.vi AprilTagFieldLayout_GetTagPose.vi AprilTagFieldLayout_GetTags.vi AprilTagFieldLayout_New.vi AprilTagFieldLayout_New2022.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
Implemented Documented Not WPILIB Menu Item Execution Optimized Test Routine				e Review	Program	r Checking
### Son Optimized On Optimized	VI Name AprilTagPoseEstimate_GetAll.vi AprilTagPoseEstimate_GetAmbiguity.vi AprilTagPoseEstimate_New.vi	Function Prototype	Notes	(eview Code	ogram	hecking
FIELD DISPLAY X X X X X X X X X X X X X X X X X X X	VI Name FieldDisp_Element_Disp.vi FieldDisp_Element_Prepare.vi FieldDisp_Element_Rotate.vi	Function Prototype	Notes	Code R	Test Pro	Error Ch

d F	ield Dis	play						
	X)	(no		FieldDisp_Element_Rotate_Init.vi		
	X	>	(no		FieldDisp_Field_Crop_and_Scale.vi		
	$X \mid X$	()	(X	Χ	FieldDisp_Field_Disp.vi		
	X	()	(X	Χ	FieldDisp_Field_Selector_Prepare.vi		
	X	\ \ \ \ \ \ \	(no		FieldDisp_Get_Field_Info.vi		
	X)	(no		FieldDisp_Open_Field_Info_File.vi		
	X	>	(no		FieldDisp_Read_Field_Pic.vi		
	X)	(no		FieldDisp_Read_Image_File.vi		

'======== COMMUNICATIONS

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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program Name	Function Prototype Notes	Code Review	Test Program	Error Checking
NETWORK UDP	X	Χ	Χ	Χ	SI		NetworkUDP_Close.vi				
	Χ	Χ	Χ	Χ	1		NetworkUDP_Receive.vi				
	Χ	Χ	Χ	Χ	1		NetworkUDP_Send.vi				

'======== TYPE DEFINITIONS

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optim	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TypeDef	Z	Z	Χ	X	N/A			AprilTag.ctl		
,	Ζ	Ζ	Χ	X	N/A			AprilTagFieldLayout,ctl		
	Ζ	Ζ	Χ	X	N/A			AprilTagFieldLayoutOriginPosition_ENUM.ctl		
	Ζ	Ζ	Χ	X	N/A			AprilTagFields_ENUM.ctl		
	Ζ	Ζ	Χ	X	N/A			AprilTagPoseEstimate.ctl		
	Ζ	Ζ	Χ	X	N/A			ARM FF.CTL		
	Ζ	Ζ	Χ	X	N/A			BANG BANG.CTL		
	I		X	X	N/A			BICon-Matrix_FUNC_TYPE.CTL		NOT USED. Should this be deleted or abandoned???
	Ζ	Ζ	Χ		N/A			CALLBACK_FUNC_TYPE.CTL		
	Ζ	Ζ	Χ	X	N/A			CHASSIS_SPEEDS.CTL		
	Ζ	Ζ	Χ	Χ	N/A			CONTRAINED_STATE.CTL		
	Ζ	Ζ	Χ		N/A			COORDINATE_AXIS.CTL		
	Ζ	Ζ	Χ		N/A			COORDINATE_SYSTEM.CTL		
	Ζ	Ζ	Χ	Χ	N/A			DCMOTOR_SIM.CTL		
	/		/		/			DCMOTOR_SIM_MODEL_PARAMS.CTL		OBSOLETE – Removed
	Ζ	Ζ	Ζ		N/A			DCMOTOR_SIM_SIMULATION_PARAMS.CTL		
	Ζ	Ζ	Χ		N/A			DCMOTOR_TYPES_ENUM.CTL		
	Ζ	Ζ	Χ	X	N/A			DCMOTOR.CTL		
	Ζ	Ζ	Χ	X	N/A			DEBOUNCER_TYPE_ENUM.Ctl		
	Ζ	Ζ	X	Χ	N/A			DEBOUNCER.CTL		
	Ζ	Ζ	Χ	Χ	N/A			DIFF_DRIVE_ACCEL_LIMIT.CTL		
	Ζ	Ζ	Χ	Χ	N/A			DIFF_DRIVE_KINEMATICS.CTL		
	Ζ	Ζ	X	Χ	N/A			DIFF_DRIVE_Kitbot_WheelSize_ENUM.ctl		
	Ζ	Ζ	X	X	N/A			DIFF_DRIVE_ODOM2.ctl		
_	Ζ	Ζ	Χ	Χ	N/A			DIFF_DRIVE_Pose_EST.ctl		
	Ζ	Ζ	Χ	X	N/A			DIFF_DRIVE_POSE_EST2.ctl		
	Ζ	Ζ	Χ	Χ	N/A			DIFF_DRIVE_POSE_EST2_CONFIG.CTL		
	Ζ	Ζ	X		N/A			DIFF_DRIVE_POSE_EST2_INTERP_RECORD.CTL		
]	Z	Ζ	Χ		N/A			DIFF_DRIVE_ToughBoxMini_GearChoice_ENUM.ctl		
	Ζ	Ζ	Χ	Χ	N/A			DIFF_DRIVE_ToughBoxMini_MotorChoice_ENUM.ctl		
	Ζ		Z	Χ	N/A			DIFF_DRIVE_SIM_MODEL_PARAMS		
	Ζ		Z	X	N/A			DIFF_DRIVE_SIM_SIMULATION_PARAMS.CTL		

	d Field I	Displa	v				
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							OTIL_WEIGHTED_WATTOHNT.VI
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2	Z	Z	X		N/A	LINEAR_PLANT_INV_FF.ctl	
Z	Z	Z	X		N/A		
Z					N/A	LINEAR SYSTEM ID DCMOTOR MODEL.CTL	
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Z	Z	Z	X	Χ	N/A		
Z	Z	Z	Z	X	N/A	LTV_DIFF_DRIVE_CTRL_TOLERANCE.CTL	
Z	Z	Z	X	Χ	N/A	LTV DIFF DRIVE CTRL.ctl	
Z	Z	Z	Z	Χ	N/A	LTV UNICYCLE CONTROLLER MODEL PARAMS.CTL	
Z	Z	Z	X	Χ	N/A	LTV UNICYCLE CONTROLLER STATE ENUM.ctl	
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Z	Z				RAMSETE_EXE_TUNING.CTL	
Z	Z	Χ		N/A	RAMSETE.CTL RAMSETE.CTL	
Z	Ζ	Χ		N/A	ROTATION2D.CTL	
Z	Ζ	Χ		N/A	ROTATION3D.CTL	
Z	Z	Ζ		N/A	SIMPLE_MOTOR_FF_KA_TUNE_PARAMS.CTL	
Z	Z	X	X	N/A	SIMPLE_MOTOR_FF.CTL	
Z	Z	X	X	N/A	SINGLE JOINT ARM SIM.CTL	
Z	Z	X		N/A	SINGLE JOINT ARM SIM SIMULATION PARAMS.CTL	
Z	Z	X	X	N/A	SLEW RATE LIMITER.CTL	
Z	Z	Χ	Χ	N/A	SPLINE CTRL VECTOR.CTL	
Z	Z	X		N/A	SPLINE.CTL	
Z	Z	X		N/A	SWERVE DRIVE KINEMATICS.CTL	
Z	Z	X		N/A	SWERVE DRIVE MODULE POSITION.CTL	
Z	Z	X		N/A	SWERVE DRIVE MODULE STATE.CTL	
Z	Z	X		N/A	SWERVE DRIVE ODOMETRY.CTL	
Z	Z	X		N/A	SWERVE DRIVE Pose EST.CTL	
-		X		N/A	SWERVE DRIVE POSE EST.CIL	
Z	-					
Z	Z	X		N/A	SWERVE_DRIVE_POSE_EST2_CONFIG.CTL	
Z		X		N/A	SWERVE_DRIVE_POSE_EST2_INTERP_RECORD.CTL	
Z	Z	X		N/A	TIME_INTERPOLATABLE_BOOLEAN.CTL	
Z	Z	Χ		N/A	TIME_INTERPOLATABLE_DOUBLE.CTL	
Z	Ζ	Χ		N/A	TIME_INTERPOLATABLE_POSE2D.CTL	
Z	Z	Χ		N/A	TIME_INTERPOLATABLE_ROTATION2D.CTL	
Z	Z	Ζ		N/A	TIME_INTERPOLATABLE_VARIANT.CTL	
Z	Z	X	X	N/A	TIMER.CTL TIMER.CTL	
Z	Z	X	X	N/A	TRAJ_CONFIG.CTL	
Z	Z	X	X	N/A	TRAJ CONSTRAINT CENTRIPETAL ACCEL.CTL	
Z	Z	X	X	N/A	TRAJ CONSTRAINT DIIF DRIVE KINEMATICS.CTL	
Z	Z	Χ	Χ	N/A	TRAJ CONSTRAINT DIIF DRIVE VOLTAGE.CTL	
Z	Z	Χ	Χ	N/A	TRAJ CONSTRAINT ELLIP REGION.CTL	
1		Χ		N/A	TRAJ CONSTRAINT JERK.CTL	Routine exists, it is just a shell
Z	Ζ	Χ	Χ	N/A	TRAJ_CONSTRAINT_MAX_VELOCITY.CTL	, ,
Z	Z	X		N/A	TRAJ CONSTRAINT MECA DRIVE KINEMATICS.CTL	
Z	Z	X		N/A	TRAJ CONSTRAINT MINMAX.CTL	
Z	Z	X		N/A	TRAJ_CONSTRAINT_RECT_REGION.CTL	
Z	Z	X		N/A	TRAJ CONSTRAINT SWERVE DRIVE KINEMATICS.CTL	
Z	Z	X		N/A	TRAJ STATE.CTL	
Z	Z	X		N/A	TRAJECTORY SPLINE TYPE ENUM.CTL	
Z	Z	X		N/A	TRAJECTORY.CTL	
		X		N/A	TRANSFORM2D.CTL	
Z	Z	X	X	N/A N/A		
					TRANSFORM3D.CTL	
<u>Z</u>	Z	X		N/A	TRANSLATION2D.CTL	
Z	Z	X		N/A	TRANSLATION3D.CTL	
Z	Z	X		N/A	TRAPEZOID_PROFILE_CONSTRAINT.CTL	
Z	Z	X		N/A	TRAPEZOID_PROFILE_STATE.CTL	
Z	Ζ	Χ		N/A	TRAPEZOID_PROFILE.CTL	
Z	Ζ	Χ		N/A	TWIST2D.CTL	
Z	Ζ	Χ		N/A	TWIST3D.CTL	
Z	Ζ	Χ		N/A	UNSCENTED_KALMAN_CORRECT_FUNC_GROUP.CTL	
Z	Ζ	Χ		N/A	UNSCENTED_KALMAN_FILTER.ctl	
Z	Ζ	Χ		N/A	UNSCENTED_KALMAN_NEW_FUNC_GROUP.CTL	
Z	Ζ	Χ		N/A	UTIL_PATHFINDER_CONFIG.CTL	
N/A		N/A		N/A	WAYPOINTS.CTL	Delete – obsolete
Z	Ζ	Χ	Χ	NA	WEIGHTED WAYPOINT.CTL	New V1.5
N/A		N/A		N/A	X Y HEADINGS.CTL	Delete – obsolete
Z	Ζ	Χ	Χ		X Y PAIR.CTL	
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