Revision 3.04 2/11/2023 – Added new pose est2

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

VI / CTL Totals VI Total (X) CTL Total (Z) VI Shell Total (/) CTRL Shell Total (/) CTRL Shell Total (/) 2

Doc completed Pct 97.73% Optimization Pct 58.14%

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

'===== BASE

BASE '=========

Category Category		X Documented X Not WPILIB		- Execution Optimized	Test Routine		VI Name AnalogDelay_Execute.vi	Function Prototype	Notes Similar to interpolated tree map	Code Review	Test Program	Error Checking
DUMPI FOO TRANSFER		Documented		- Execution Optimized	Test Routine			Function Prototype	Notes	Code Review	Test Program	Error Checking
BUMPLESS TRANSFER	70	Documented X Not WPILIB X		Execution Optimized	Test Routine	mple Program	BumplessTransfer_Execute.vi VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
FUNCTION GENERATOR	X X X	X	X X X				FunctionGenerator_Add_Value.vi FunctionGenerator_Add_XY.vi FunctionGenerator_Calculate.vi FunctionGenerator_Clear.vi FunctionGenerator_Execute.vi		Similar to interpolated tree map			
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Revision 3.04 2/11/2023 – Added new pose est2 Routine Test 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 X X X SI X X X X X X X X X X I LinearFilter Calculate.vi LinearFilter_CutoffFrequency.vi 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 X X X X LinearFilter LowPassBW2.vi 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 X MedianFilter Calculate.vi 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 SlewRateLimiter_New.vi XX Χ XX Χ SlewRateLimiter NewInitialZero.vi X X X X X I X SI SlewRateLimiter Reset.vi Х

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SlewRateLimiter_SetRate.vi

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	X	X		X			X Timer_HasPeriodPassed.vi					
			X				X Timer_HasPeriodPassedOnce.vi X Timer_New.vi					
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	X	X		X	SI		BangBang_Calculate_SP_PV.vi					
	Χ	Х	X	X	SI		BangBang_Execute.vi					
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HOL_DRV_CTRL	X	X	X	X				HolDrvCtrl AdvCalculate.vi		Added 1/24/2022 Added 1/24/2022			
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	Χ	Χ		Χ	- 1			HolDrvCtrl_Calculate_Trajectory.vi		Added 1/26/21			
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	X	X	X	X				HolDrvCtrl_Execute_Trajectory.vi		Added 1/24/2022			
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	X	X	X	X	SI			HolDrvCtrl_PackExecuteSP.vi		MUGU 1/20/21			
	X	X	X	X				HolDrvCtrl_PackPID.vi		Added 1/24/2022			
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	X X X X X X X X X X X X X X X X X X X	X X X	X X	SI SI		PIDController_Pack_InputLimits.vi PIDController_Pack_Tuning.vi PIDController_Reset.vi PIDController_SetD.vi PIDController_SetDerivativeFilter.vi PIDController_SetFeedForward_OBSOLETE_DELETE.vi		Advanced PID			
X	X X X X X X X X X X X X X X X X X X X	X X X	X X X X No	SI SI		PIDController Pack Tuning.vi PIDController Reset.vi PIDController SetD.vi PIDController SetDerivativeFilter.vi					
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X X X X X X X	X X X X X	X				PIDController_SetInputRange.vi		OBSOLETE – Removed			
X X X X X X	X X X X	X	X			PIDController_SetIntegratorRange.vi					<u> </u>
X X X X	X X X X	-	Χ	SI		PIDController_SetOutputLimits.vi		Advanced PID			-
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X	X	Χ	X	SI		PIDController_SetPIDF.vi		Advanced PID			
<u>x</u>	X			SI		PIDController_SetSetpoint.vi					
X			X	SI		PIDController_SetTolerance.vi					1
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X				SI		ProfiledPIDController_AtSetpoint.vi					-
X			Χ			ProfiledPIDController_Calculate_Meas_Goal.vi					
X	X		Х			ProfiledPIDController_Calculate_Meas_StateGoal_TrapCnsrt.vi				i	I
X	X		Х		ļ	ProfiledPIDController_Calculate_Meas_StateGoal.vi				.	ı
X	X		X			ProfiledPIDController Calculate Meas.vi					
X			X	SI	\neg	ProfiledPIDController DisableContInput.vi					<u> </u>
X			X	SI	$\overline{}$	ProfiledPIDController EnableContInput.vi					i
X				1		ProfiledPIDController_Execute.vi		Single call LabVIEW style function.			
X	X		X			ProfiledPIDController GetGoal.vi					
			$\frac{\lambda}{X}$	SI	\longrightarrow	ProfiledPIDController GetPeriod.vi					
X		V		SI				WDILID become to the second			
X		X				ProfiledPIDController_GetPID.vi		WPILIB has separate getters.			
X			X	SI		ProfiledPIDController_GetPositionError.vi					-
X			Χ			ProfiledPIDController_GetSetpoint.vi					-
X				SI		ProfiledPIDController_GetTolerance.vi					
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X			X	1		ProfiledPIDController_New.vi					1
X	X		X	1		ProfiledPIDController_NewPeriod.vi					
X	X		X	SI		ProfiledPIDController_Reset_PosOnly.vi					
X			X	SI		ProfiledPIDController_Reset_PosVel.vi					
X			X	SI		ProfiledPIDController Reset.vi					
X			X	SI		ProfiledPIDController SetConstraints.vi					
X			X	SI		ProfiledPIDController SetGoal PosOnly.vi					i
X			X	SI	$\overline{}$	ProfiledPIDController SetGoal.vi					i
X			X	SI		ProfiledPIDController_SetIntegratorRange.vi					
X			X	SI		ProfiledPIDController_SetPID.vi					
X			X	SI		ProfiledPIDController_SetTolerance_PosOnly.vi					
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		X	SI	Ramsete_Execute_PackTuning_ENG.vi					
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			SI						
XX	+	X	SI						
		X	S/		public double calculate(double velocity)				
			V						
X X		Χ .	X	SimpleMotorFF_MaxAchieveAccel.vi					
XX		Χ.	X	SimpleMotorFF_MaxAchieveVel.vi	public double maxAchievableVelocity(double maxVoltage, double				
XX		Χ.	X	SimpleMotorFF_MinAchieveAccel.vi	public double minAchievableAcceleration(double maxVoltage, double velocity)				
				SimpleMotorFF_MinAchieveVel.vi	public double minAchievableVelocity(double maxVoltage, double acceleration)				
					public SimpleMotorFeedforward(double ks, double kv, double ka)				
XX	X	,	SI	SimpleMotorFF_Pack_Ka_Tune_Params.vi	public Circula Matay Foodfow youd (double to double to)				
X X X X X X X X X X		X	SI SI SI SI SI	VI Name CoordAxis D.vi CoordAxis E.vi CoordAxis N.vi CoordAxis New.vi CoordAxis S.vi CoordAxis U.vi CoordAxis U.vi CoordAxis W.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
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	X			SI			Pose2d_Div.VI					
	X		Χ	SI			Pose2d_Equals.VI	boolean equals(other obj)				ĺ
(X		Χ	X			Pose2d_Exp.vi	pose2d exp(twist2d twist)				
	X		Χ	SI			Pose2d_getRotation.vi	rotation2d getRotation()	can also use cluster unpack			
7	X		Χ	SI			Pose2d_getTranslation.vi	translation2d getTranslation()	can also use cluster unpack			
7	X	X	X	SI			Pose2d_getXY.vi	· ·				
7	X	X	Χ	SI			Pose2d_getXYAngle.vi					
	X		X	1			Pose2d_Interpolate.vi					ĺ
7	X		Χ	Χ			Pose2d_Log.vi	twist2d log(pose2d end)				
								transform2d minus(pose2d other)				
				SI			Pose2d New TRRO.vi					
				SI				pose2d plus(transform2d other)				
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7	X		Χ	SI			Pose3d getTranslation.vi					
	X	X	Χ	SI			Pose3d getXYZ.vi					1
				1			Pose3d Interpolate.vi					ĺ
7	X		Χ	Χ			Pose3d Log.vi					
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)	X		X	SI			Quaternion Get LVQuat.vi					
	$\frac{x}{x}$		X	SI			Quaternion_Get_Vect.vi					
	$\frac{x}{x}$		X	SI			Quaternion Get W.vi					
)			X	SI			Quaternion Inverse.vi					
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)	Χ		X	SI SI			Quaternion_New.vi Quaternion_New_Default.vi Quaternion New LVQuat.vi					
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X	λ	()	X	SI	Quaternion_Times.vi
X		(7	X	SI	Quaternion ToRotationVector.vi

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
ROTATION2D	Χ	X		X	SI			Rotation2d_CreateAngle.vi	rotation2d new(double value)				
	Χ	X		Χ	SI			Rotation2d_CreateAngleDegrees.vi	rotation2d fromDegrees(double degrees)	convert to radians then create			
	X	Χ		X	SI			Rotation2d_CreateAngleRotations.vi					
	X	Χ		Χ	SI			Rotation2d_CreateXY.vi	rotation2d new(double x, double y)				
	Χ	X			SI			Rotation2d_Div.vi					
	X	X		X	SI			Rotation2d_Equals.vi	boolean equals(rotation2d other)				
	Χ	Χ	Χ	Χ	SI			Rotation2d_GetAngleCosSin.vi		New 1/26/21			
	Χ	X		X	SI			Rotation2d_GetCos.VI	double getCos()	use cluster unpack			
	X	X		X	SI			Rotation2d_GetDegrees.VI	double getDegrees()	use cluster unpack, then convert to degree			
	Χ	Χ		Χ	SI			Rotation2d_GetRadians.VI	double getRadians()	use cluster unpack			
	Χ	Χ		Χ	SI			Rotation2d_GetRotations.vi					
	Χ	X		Χ	SI			Rotation2d_GetSin.VI	double getSin()	use cluster unpack			
	Χ	Χ		Χ	SI			Rotation2d_GetTan.VI	double getTan()	can calculate			
	Χ	X		Χ	SI			Rotation2d_Interpolate.vi					
	Χ	X		X	SI			Rotation2d_Minus.vi	rotation2d minus(rotation2d other)				
	Χ	Χ		X	SI			Rotation2d_Plus.vi	rotation2d plus(rotation2d other)				
	Χ	Χ		X	SI			Rotation2d_RotateBy.vi	rotation2d rotateby(rotation2d other)				
	Χ	Χ		Χ	SI			Rotation2d_Times.vi	rotation2d times(double scalar)				
	Χ	Χ		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	Function Prototype	Notes	Code Review	Test Program	Error Checking
ROTATION3D	X	X		Χ	SI		Rotation3d_Create_AxisAngle.vi					
	X	X		X	SI		Rotation3d_Create_Default.vi					
	X	X		X	SI		Rotation3d_Create_Quaternion.vi					
	X	X		X	I		Rotation3d_Create_InitialFinalVector.vi					
	X	X		Χ	SI		Rotation3d_Create_RollPitchYaw.vi					
	X	X		Χ	I		Rotation3d_Create_RotMatrix.vi					
	X	X			SI		Rotation3d_Div.vi					
	X	X		X	SI		Rotation3d_Equals.vi					
	X	X	X	Χ	SI		Rotation3d_GetAxisAngle.vi					
	Χ	X		Χ	SI		Rotation3d_GetQuaternion.vi					
	Χ	X		Χ	SI		Rotation3d_GetXYZ.vi					
	Χ	X		Χ	SI		Rotation3d_Interpolate.vi					
	X	X		X	SI		Rotation3d_Minus.vi					
	X	X		Χ	SI		Rotation3d_Plus.vi					
	Χ	X		X	SI		Rotation3d_RotateBy.vi					
	Χ	X		X	SI		Rotation3d_Times.vi					
	Χ	X		X	SI		Rotation3d_ToRotation2d.vi					
	Χ	Χ		X	SI		Rotation3d_UnaryMinus.vi					

	Implemented	Documented	Not WPILIB Menu Item	:	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
TRANSFORM2D	X	X	λ	()	SI		Transform2d_Create_PosePose.vi	transform2d new(pose2d, pose2d)				

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r													
	X	X		X	SI		Tra	ansform2d_Create_TransRot.vi	transform2d new(translation2d, rotation2d)				
	X	X			SI		Tra	ansform2d Div.vi					
	X	X			SI			ansform2d Equals.VI	boolean equals(other transform2d)				
	X	X			SI			ansform2d_GetRotation.VI	rotation2d getRotation()	use cluster unpack			
	Χ	X			SI			ansform2d_GetTranslation.VI	translation2d getTranslation()	use cluster unpack			
	X	X	X	X	SI		Tra	ansform2d_GetXY.vi					
	X	X	X	X	SI		Tra	ansform2d_GetXYAngle.vi					
-	X	X			SI		Tr	ansform2d Inverse.vi	transform inverse()	new			
-										IICW			
	Χ	Χ			Si			ansform2d_Plus.vi					
	X	X		Χ	SI		Tra	ansform2d_Times.vi	transform2d times(double scalar)				
									transform2d new()	can use cluster constant			
SFORM3D	X X Implemented	X X X X	Not N	X Wenu Item	IS IS Execution Optimi	Test Routine	Tra Tra Tra Tra Tra	Name ansform3d_Create_Default.vi ansform3d_Create_Pose3dPose.3dvi ansform3d_Create_Trans3dRot3d.vi ansform3d_Div.vi ansform3d_Equals.VI	Function Prototype	Notes	Code Review	Test Program	Error Checking
	Χ	X			SI			ansform3d_GetRotation3d.VI					
	Χ	X			SI			ansform3d_GetTranslation3d.VI					
	Χ		X		SI			ansform3d GetXYZ.vi					
	X	\overline{x}			SI			ansform3d Inverse.vi					
		X			Si			ansform3d_filverse.vi			+		
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	Implemented	Documented	Not WPILIB		Execution Optimized	Test Routine	Sample Program ≤	Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
ATION2D [[]		X Documented	Not	Menu Item		Test Routine	Sample S	Name anslation2d Create DistAng.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
ATION2D	X	X	Not Not	X Menu Item	S Execution	Test Routine	Samble VI Tra	anslation2d_Create_DistAng.vi		Notes	Code Review	Test Program	Error Checking
ATION2D	X	X X	Not Not	X Menu Item	IS Execution	Test Routine	Samble IV Samble Tra	anslation2d_Create_DistAng.vi anslation2d_Create.vi	Function Prototype translation2d new(double x, double y)	Notes	Code Review	Test Program	Error Checking
ATION2D	X X X	X X X	Not	X Menu Item	IS IS Execution	Test Routine	VI Samble Tra	anslation2d_Create_DistAng.vi anslation2d_Create.vi anslation2d_Div.vi	translation2d new(double x, double y)	Notes	Code Review	Test Program	Error Checking
ATION2D	X	X X X X	Not	X Wenu Item	IS Execution	Test Routine	VI Samble Tra	anslation2d_Create_DistAng.vi anslation2d_Create.vi anslation2d_Div.vi anslation2d_Equals.vi		Notes	Code Review	Test Program	Error Checking
ATION2D	X X X	X X X X	Not	X Wenu Item	IS Execution	Test Routine	VI Samble Tra	anslation2d_Create_DistAng.vi anslation2d_Create.vi anslation2d_Div.vi anslation2d_Equals.vi	translation2d new(double x, double y)	Notes	Code Review	Test Program	Error Checking
ATION2D	X X X X	X X X X	Not	X X Wenu Item	IS Execution	Test Routine	VI Samble VI Tra	anslation2d_Create_DistAng.vi anslation2d_Create.vi anslation2d_Div.vi anslation2d_Equals.vi anslation2d_GetAngle.vi	translation2d new(double x, double y) boolean equals(translation other)	Notes	Code Review	Test Program	Error Checking
ATION2D	X X X X X	X X X X X	Not	X Wenu Item	IS Execution	Test Routine	VI Tra Tra Tra Tra Tra	anslation2d_Create_DistAng.vi anslation2d_Create.vi anslation2d_Div.vi anslation2d_Equals.vi anslation2d_GetAngle.vi anslation2d_GetDistance.vi	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other)		Code Review	Test Program	Error Checking
ATION2D	X X X X X X	X X X X X X	Not	X X Wenu Item	IS Execution	Test Routine	VI	anslation2d_Create_DistAng.vi anslation2d_Create.vi anslation2d_Div.vi anslation2d_Equals.vi anslation2d_GetAngle.vi anslation2d_GetDistance.vi anslation2d_GetNorm.VI	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm()	can use cluster unpack	Code Review	Test Program	Error Checking
ATION2D	X X X X X X X	X X X X X X X	Not	X X Wenu Item	IS Execution	Test Routine	VI	anslation2d_Create_DistAng.vi anslation2d_Create.vi anslation2d_Div.vi anslation2d_Equals.vi anslation2d_GetAngle.vi anslation2d_GetDistance.vi anslation2d_GetNorm.VI anslation2d_GetX.VI	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other)		Code Review	Test Program	Error Checking
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		X	X		X SI		Translation3d Plus.vi						Х
		X	X		X SI		Translation3d RotateBy.vi						Х
			X		X SI		Translation3d Times.vi						Х
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WPILib LabVIEW Math Library - VI Implementation List Revision 3.04 2/11/2023 – Added new pose est2 DIFFERENTIAL DRIVE ODOMETRY DiffOdometry_Execute.vi DONT NEED Χ DiffOdometry_Update.vi pose2d update(rotation2d gyro, double leftdist, double right dist) Incorporates enhanced reset diffDrOdom new(rotation gyro, pose initial) diffDrOdom new(rotation gyro) void resetPosition(pose2d, rotation2d) incorporated into "update" pose2d getPoseMeters() Function Prototype Notes DIFFERENTIAL DRIVE ODOMETRY 2 DiffDrvOdom2 Execute.vi Χ Replacement for orig diff drive XX SI DiffDrvOdom2 GetPosevi X X X X DiffDrvOdom2_New.vi 1 SI DiffDrvOdom2_Reset.vi Χ DiffDrvOdom2 Update.vi Function Prototype Notes DIFFERENTIAL DRIVE WHEEL SPEEDS diffDrWheelSpeeds new() diffDrWheelSpeeds new(double leftVel, double rightVel) XX DiffWheel Normalize.vi void normalize(double maxVel) Function Prototype Notes MECANUM DRIVE KINEMATICS X X Χ MecaKinematics New.vi X X X X X X Χ MecaKinematics SetInverseKinematics.vi MecaKinematics_ToChassisSpeeds.vi X MecaKinematics ToTwist2d.vi Χ Χ X X MecaKinematics ToWheelSpeeds.vi Χ MecaKinematics_ToWheelSpeedsZeroCenter.vi Χ VI Name Function Prototype Notes MECANUM DRIVE MOTOR VOLTAGE

Function Prototype

Notes

VI Name

MecaOdometry_Execute.vi MecaOdometry GetKinematics.vi

MecaOdometry_GetPose.vi

MecaOdometry New.vi

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FRC_LabVIEW_Trajectory_Library_Routines.xlsx

MECANUM DRIVE ODOMETRY

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		/		_			MecaOdometry_NewDefaultPose.vi					
			X				MecaOdometry_Reset.VI					
_	()	Υ	X		_		MecaOdometry_Update.vi		Demoved			
							MecaOdometry_UpdateWithTime.vi		Removed			
	()		\overline{X}	SI		Sample Program	MecaWheelPos_Get.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	()	<u>ν</u>	X		+		MecaWheelPos_New.vi MecaWheelPos_Sub.vi					
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MECANUM DRIVE WHEEL SPEEDS X	2		X Menu Item		Test Routine	Sample Program	VI Name MecaWheel_New.Vi	Function Prototype public MecanumDriveWheelSpeeds(double frontLeftMetersPerSecond, double frontRightMetersPerSecond, double rearLeftMetersPerSecond, double	Notes	Code Review	Test Program	Error Checking
	, ,	v V	V	0/			Marshall Catallai	rearRightMetersPerSecond, double				
$\frac{x}{x}$	()	X X	X				MecaWheel_GetAll.vi MecaWheel Normalize.vi	public void normalize(double				
^	` ′	`	^	^			Iviecavvileer_Normalize.vi	attainableMaxSpeedMetersPerSecond)				
molemented		Vot WPILIB	Menu Item	Execution Opt	Test Routine	Sample Progra	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
SWERVE DRIVE KINEMATICS X		\overline{X}	X		T	Τ,	SwerveKinematics_New4.VI	71	For 4 module drives			
X	()	(X	X				SwerveKinematics_NewX.VI		uses array as input			
X		X					SwerveKinematics_NormalizeWheelSpeeds.vi	public static void normalizeWheelSpeeds(SwerveModuleState[] moduleStates, double attainableMaxSpeedMetersPerSecond)				
X	()	<i>X</i>	X				SwerveKinematics_ToChassisSpeeds4.VI	,	For 4 module drives			
		X X					SwerveKinematics_ToChassisSpeedsX.VI	LE O. M. L. O. L. B.	uses array as input			
X		×	X				SwerveKinematics_ToSwerveModuleStates.VI	public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds, Translation2d centerOfRotationMeters)				
	()		X				SwerveKinematics_ToSwerveModuleStatesZeroCenter.VI	public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds)				
<u> </u>	()	Κ	X				SwerveKinematics_ToTwist2d4.VI 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)			
pape		Documented Not WPILIB	Menu Item	Execution Optimized	Test Routine	imple Program			anay unu + vanoj	Code Review	st Program	Error Checking
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Implemented							SwerveOdometry_Execute4.vi					
SWERVE DRIVE ODOMETRY						_						
SWERVE DRIVE ODOMETRY							SwerveOdometry_ExecuteX.vi	with Decod with a Material				
SWERVE DRIVE ODOMETRY	()		X				SwerveOdometry_GetPosition.VI	public Pose2d getPoseMeters()				
SWERVE DRIVE ODOMETRY X		Υ	X X					public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle)				

2023 – Added new pose est2												
	X	X	X	X			SwerveOdometry_Update4.VI		For 4 module drives			
							SwerveOdometry_UpdateWithTime4.VI		REMOVED			
							SwerveOdometry_UpdateWithTimeX.VI		REMOVED			
	X	X	Χ	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,	variable parameters (replace with			
								SwerveModuleState moduleStates)	array and "4" calls)			
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WERVE DRIVE MODULE POSITIONS	X	X			8/		SwerveModulePosition_CompareTo.vi					
	X				81		SwerveModulePosition_Equals.vi					
	Χ			X S			SwerveModulePosition Get.vi					
	X	X		X	3/		SwerveModulePosition New.vi					
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SWERVE DRIVE MODULE STATE	X	X		X	3/		SwerveModuleState CompareTo.vi	public int compareTo(SwerveModuleState o)				
	X	X			81		SwerveModuleState Equal.vi					
	X			X S			SwerveModuleState Get.vi					
	X			X	3/		SwerveModuleState_New.vi	public SwerveModuleState(double speedMetersPerSecond,				
				. .	.			Rotation2d angle)				
				1		I					1	
	X	X		X S	5/		SwerveModuleState_Optimize.vi	public SwerveModuleState optimize(SwerveModuleState desired,				
	X	X		X S	SI		SwerveModuleState_Optimize.vi	public SwerveModuleState optimize(SwerveModuleState desired, Rotation2d angle)				
	X	X		X S	SI		SwerveModuleState_Optimize.vi	public SwerveModuleState optimize(SwerveModuleState desired,				
	X	X		X S	SI		SwerveModuleState_Optimize.vi	public SwerveModuleState optimize(SwerveModuleState desired,				
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	X	X		X S	SI		SwerveModuleState_Optimize.vi	public SwerveModuleState optimize(SwerveModuleState desired,				
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	mented	mented	VPILIB	Item	ation Optimized	8 g	SwerveModuleState_Optimize.vi	public SwerveModuleState optimize(SwerveModuleState desired,		e Review	<u> ā</u>	r Checking
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CUBIC HERMITE SPLINE	Implemented	Documented	Not WPILIB	Menu Item	ation Optimized	8 g	VI Name	public SwerveModuleState optimize(SwerveModuleState desired, Rotation2d angle) Function Prototype protected SimpleMatrix getCoefficients()		Code Review	<u> ā</u>	Error Checking
CUBIC HERMITE SPLINE	Implemented	mented	Not WPILIB	Item	ation Optimized	8 g		public SwerveModuleState optimize(SwerveModuleState desired, Rotation2d angle) Function Prototype protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[]	Notes	Code Review	<u> ā</u>	Error Checking
CUBIC HERMITE SPLINE	X Implemented	X Documented	Not WPILIB	X Menu Item	ation Optimized	8 g	VI Name CubicHermiteSpline_getControlVectorFromArrays.vi	public SwerveModuleState optimize(SwerveModuleState desired, Rotation2d angle) Function Prototype protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector)	Notes	Code Review	<u> ā</u>	Error Checking
CUBIC HERMITE SPLINE	X /mplemented	X X Documented	Not WPILIB	X Menu Item	ation Optimized	8 g	VI Name CubicHermiteSpline_getControlVectorFromArrays.vi CubicHermiteSpline_makeHermiteBasis.vi	public SwerveModuleState optimize(SwerveModuleState desired, Rotation2d angle) Function Prototype protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis()	Notes not needed, use cluster unpack	Code Review	<u> ā</u>	Error Checking
CUBIC HERMITE SPLINE	X X Implemented	X Documented	Not WPILIB	X Menu Item	ation Optimized	8 g	VI Name CubicHermiteSpline_getControlVectorFromArrays.vi	public SwerveModuleState optimize(SwerveModuleState desired, Rotation2d angle) Function Prototype protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public CubicHermiteSpline(double[] xInitialControlVector, double[]	Notes not needed, use cluster unpack	Code Review	<u> ā</u>	Error Checking
CUBIC HERMITE SPLINE	X /mplemented	X X Documented	Not WPILIB	X Menu Item	ation Optimized	8 g	VI Name CubicHermiteSpline_getControlVectorFromArrays.vi CubicHermiteSpline_makeHermiteBasis.vi	public SwerveModuleState optimize(SwerveModuleState desired, Rotation2d angle) Function Prototype protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[]	Notes not needed, use cluster unpack	Code Review	<u> ā</u>	Error Checking
CUBIC HERMITE SPLINE	X /mplemented	X X Documented	Not WPILIB	X Menu Item	ation Optimized	8 g	VI Name CubicHermiteSpline_getControlVectorFromArrays.vi CubicHermiteSpline_makeHermiteBasis.vi	public SwerveModuleState optimize(SwerveModuleState desired, Rotation2d angle) Function Prototype protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public CubicHermiteSpline(double[] xInitialControlVector, double[]	Notes not needed, use cluster unpack	Code Review	<u> ā</u>	Error Checking
CUBIC HERMITE SPLINE	X /mplemented	X X Documented	Not WPILIB	X Menu Item	ation Optimized	8 g	VI Name CubicHermiteSpline_getControlVectorFromArrays.vi CubicHermiteSpline_makeHermiteBasis.vi	public SwerveModuleState optimize(SwerveModuleState desired, Rotation2d angle) Function Prototype protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[]	Notes not needed, use cluster unpack	Code Review	<u> ā</u>	Error Checking
CUBIC HERMITE SPLINE	X /mplemented	X X Documented	Not WPILIB	X Menu Item	ation Optimized	8 g	VI Name CubicHermiteSpline_getControlVectorFromArrays.vi CubicHermiteSpline_makeHermiteBasis.vi	public SwerveModuleState optimize(SwerveModuleState desired, Rotation2d angle) Function Prototype protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[]	Notes not needed, use cluster unpack	Code Review	<u> ā</u>	Error Checking
CUBIC HERMITE SPLINE	X /mplemented	X X Documented	Not WPILIB	X Menu Item	ation Optimized	8 g	VI Name CubicHermiteSpline_getControlVectorFromArrays.vi CubicHermiteSpline_makeHermiteBasis.vi	public SwerveModuleState optimize(SwerveModuleState desired, Rotation2d angle) Function Prototype protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[]	Notes not needed, use cluster unpack	Code Review	<u> ā</u>	3 Error Checking
CUBIC HERMITE SPLINE	X /mplemented	d X X X Documented	Not WPILIB	X Menu Item	Daninzed Execution Optimized	ram Sample	VI Name CubicHermiteSpline_getControlVectorFromArrays.vi CubicHermiteSpline_makeHermiteBasis.vi	public SwerveModuleState optimize(SwerveModuleState desired, Rotation2d angle) Function Prototype protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[]	Notes not needed, use cluster unpack	W Code Review	<u> ā</u>	ing Error Checking
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CUBIC HERMITE SPLINE	nted X X X X Implemented	ited X X X Documented	PILIB Not WPILIB	Item X X Menu Item	Daninzed Execution Optimized	ram Sample	VI Name CubicHermiteSpline_getControlVectorFromArrays.vi CubicHermiteSpline_makeHermiteBasis.vi	public SwerveModuleState optimize(SwerveModuleState desired, Rotation2d angle) Function Prototype protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[]	Notes not needed, use cluster unpack	Review Code Review	<u> ā</u>	Shecking Error Checking
CUBIC HERMITE SPLINE	nted X X X X Implemented	ited X X X Documented	PILIB Not WPILIB	Item X X Menu Item	Daninzed Execution Optimized	Routine Test Ro les Program Sample	VI Name CubicHermiteSpline_getControlVectorFromArrays.vi CubicHermiteSpline_makeHermiteBasis.vi	public SwerveModuleState optimize(SwerveModuleState desired, Rotation2d angle) Function Prototype protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[]	Notes not needed, use cluster unpack	le Review Code Review	<u> ā</u>	or Checking Error Checking
CUBIC HERMITE SPLINE	nted X X X X Implemented	ited X X X Documented	PILIB Not WPILIB	Item X X Menu Item	Daninzed Execution Optimized	Routine Test Ro les Program Sample	VI Name CubicHermiteSpline_getControlVectorFromArrays.vi CubicHermiteSpline_makeHermiteBasis.vi CubicHermiteSpline_New.vi	Function Prototype protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public CubicHermiteSpline(double[] xFinalControlVector, double[] yFinalControlVector)	Notes not needed, use cluster unpack	ode Review Code Review	st Program Test Pr	ror Checking
	Implemented X X X Implemented	Documented X X X Documented	Not WPILIB Not WPILIB	Menu Item X X Menu Item	Execution Optimized	st Routine Test Ro mple Program Sample	VI Name CubicHermiteSpline_getControlVectorFromArrays.vi CubicHermiteSpline_makeHermiteBasis.vi CubicHermiteSpline_New.vi	Punction Prototype protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public CubicHermiteSpline(double[] xFinalControlVector, double[] yFinalControlVector) Function Prototype Function Prototype	Notes not needed, use cluster unpack	Code Review Code Review	<u> ā</u>	Error Checking Error Checking
CUBIC HERMITE SPLINE	Implemented X X X Implemented	ited X X X Documented	Not WPILIB Not WPILIB	Menu Item X X X Menu Item	Daninzed Execution Optimized	Routine Test Ro les Program Sample	VI Name CubicHermiteSpline_getControlVectorFromArrays.vi CubicHermiteSpline_makeHermiteBasis.vi CubicHermiteSpline_New.vi	Punction Prototype protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector) Function Prototype public PoseWithCurvature(Pose2d poseMeters, double	Notes not needed, use cluster unpack	Code Review Code Review	st Program Test Pr	ror Checking
	Implemented X X X Implemented	Documented X X X Documented	Not WPILIB Not WPILIB	Menu Item X X Menu Item	Execution Optimized	Routine Test Ro les Program Sample	VI Name CubicHermiteSpline_getControlVectorFromArrays.vi CubicHermiteSpline_makeHermiteBasis.vi CubicHermiteSpline_New.vi	Punction Prototype protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector) Function Prototype public PoseWithCurvature(Pose2d poseMeters, double curvatureRadPerMeter)	Notes not needed, use cluster unpack Notes	Code Review Code Review	st Program Test Pr	ror Checking
	Implemented X X X Implemented	Documented X X X Documented	Not WPILIB Not WPILIB	Menu Item X X Menu Item	Execution Optimized	Routine Test Ro les Program Sample	VI Name CubicHermiteSpline_getControlVectorFromArrays.vi CubicHermiteSpline_makeHermiteBasis.vi CubicHermiteSpline_New.vi	public SwerveModuleState optimize(SwerveModuleState desired, Rotation2d angle) Function Prototype protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector) Function Prototype public PoseWithCurvature(Pose2d poseMeters, double curvatureRadPerMeter) public PoseWithCurvature()	Notes not needed, use cluster unpack Notes can use cluster constant	Code Review Code Review	st Program Test Pr	ror Checking
	Implemented X X X Implemented	Documented X X X Documented	Not WPILIB Not WPILIB	Menu Item X X Menu Item	Execution Optimized	Routine Test Ro les Program Sample	VI Name CubicHermiteSpline_getControlVectorFromArrays.vi CubicHermiteSpline_makeHermiteBasis.vi CubicHermiteSpline_New.vi	Function Prototype protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector) Function Prototype public PoseWithCurvature(Pose2d poseMeters, double curvatureRadPerMeter) public PoseWithCurvature() public Pose2d poseMeters	Notes not needed, use cluster unpack Notes	Code Review	st Program Test Pr	ror Checking

'======= SPLINE '========

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Revision 3.04 2/11/2023 – Added new pose est2

<i>x</i>	X)	(No	SplineParam_StackPop.vi	internal		
X	x >	(No	SplineParam StackPush.vi	internal		

public double getStartVelocity()

can use cluster unpack

'======= **TRAJECTORY** '======= VI Name Function Prototype Notes **TRAJECTORY** Χ Trajectory Concatenate.vi Trajectory_equals.vi boolean equals(other obj) **FUTURE** Χ Χ Χ SI Trajectory GetStates.vi public List<State> getStates() not needed, use unpack XX X SI Trajectory GetTotalTime.vi public double getTotalTimeSeconds() not needed, use unpack Χ Χ No SI Trajectory lerp double.vi private static double lerp(double startValue, double endValue, double t) X Χ No SI private static Pose2d lerp(Pose2d startValue, Pose2d endValue, Trajectory_lerp_Pose.vi double t) X Χ Χ SI Trajectory_New_Empty.vi XX X SI Trajectory_New.vi public Trajectory(final List<State> states) XX Trajectory RelativeTo.vi public Trajectory relativeTo(Pose2d pose) X Trajectory_Sample.vi public State sample(double timeSeconds) $X \mid X$ X Sample in reverse order. Negate X Trajectory_SampleReverse.vi $X \mid X$ Χ public Trajectory transformBy(Transform2d transform) XX Χ Trajectory TransformBy.vi public Pose2d getInitialPose() can use cluster unpack, array index Function Prototype Notes TRAJECTORY STATE X X SI TrajectoryState_Equals.vi boolean equals(other obj) Χ XX Χ SI TrajectoryState GetAll.vi XX X SI TrajectoryState GetPose.vi State interpolate(State endValue, double i) TrajectoryState_Interpolate.vi $X \mid X$ X public State(double timeSeconds, double TrajectoryState_New.vi SI velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State() Function Prototype TRAJECTORY CONFIG X TrajectoryConfig AddConstraint.vi public TrajectoryConfig addConstraint(TrajectoryConstraint Implemented differently, can't constraint) duplicate. public TrajectoryConfig addConstraints(List<? extends Implemented differently, can't Χ TrajectoryConfig_AddConstraints.vi X TrajectoryConstraint> constraints) Χ X Χ SI TrajectoryConfig Create.vi public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq) X TrajectoryConfig GetCentripetalAccel.vi X X X X TrajectoryConfig_GetConstraints.vi public List<TrajectoryConstraint> getConstraints() Implemented differently, can't Χ duplicate. TrajectoryConfig_GetEndVelocity.vi XX Χ can use cluster unpack public double getEndVelocity() Χ TrajectoryConfig GetKinematicsDiffDrive.vi Χ Χ

TrajectoryConfig GetKinematicsMecanumfDrive.vi

TrajectoryConfig GetKinematicsSwerveDrive.vi

TrajectoryConfig GetMaxVelAccel.vi

TrajectoryConfig_GetStartVelocity.vi

TrajectoryConfig GetVoltageDiffDrive.vi

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Χ	X		X		TrajectoryConfig_IsReversed.vi	public boolean isReversed() can use clu	uster unpack
Χ	X	X	X	SI	TrajectoryConfig_setCentripetalAc	el.vi	
X	X		X		TrajectoryConfig_SetEndVelocity.	public TrajectoryConfig setEndVelocity(double endVelocityMetersPerSecond)	
Χ	X		X	SI	TrajectoryConfig_setKinematicsDi	Drive.vi public TrajectoryConfig setKinematics(DifferentialDriveKinematics kinematics)	
Χ	X		X	SI	TrajectoryConfig_setKinematicsM	canumfDrive.vi public TrajectoryConfig setKinematics(MecanumDriveKinematics kinematics)	
X	X		X	SI	TrajectoryConfig_setKinematicsS\	erveDrive.vi public TrajectoryConfig setKinematics(SwerveDriveKinematics kinematics)	
Χ	X		X	SI	TrajectoryConfig_setReversed.vi	public TrajectoryConfig setReversed(boolean reversed)	
X	X		X		TrajectoryConfig_SetStartVelocity		
Χ	Χ	Χ	X	SI	TrajectoryConfig_setVoltageDiffDi	ve.vi	
						public double getMaxVelocity() Created fur	nction to return both
						public double getMaxAcceleration() Created fur	nction to return both
						NOTE ADD OTHER "SET" ROUTINES FOR OTHER CONTRAINTS HERE, SINCE NEW CONTRAINTS ARE SPECIFIC AND NOT GENERIC.	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
TRAJECTORY GENERATE	X	X		X				TrajectoryGenerate_Make_Cubic_CtrlVect.vi	public static Trajectory generateTrajectory(Spline.ControlVector initial, List <translation2d> interiorWaypoints, Spline.ControlVector end, TrajectoryConfig config)</translation2d>	uses cubic splines			
	X	X		X				TrajectoryGenerate_Make_Cubic.vi	public static Trajectory generateTrajectory(Pose2d start, List <translation2d> interiorWaypoints, Pose2d end, TrajectoryConfig config)</translation2d>	uses cubic splines			
	Χ	X	X	Χ				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			
	Χ	X	X	X				TrajectoryGenerate_Make_Quintic_Weighted.vi	, , , , , , , , , , , , , , , , , , , ,	New 2762			
	Χ	X		X				TrajectoryGenerate_Make_Quintic.vi	public static Trajectory generateTrajectory(List <pose2d> waypoints, TrajectoryConfig config)</pose2d>	uses quintic splines			
	X	X		Χ				TrajectoryGenerate_splinePointsFromSplines.vi	public static List <posewithcurvature> splinePointsFromSplines(Spline[] splines)</posewithcurvature>				
					þ								

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimize	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
TRAJECTORY GENERATE (Control Vector))								public ControlVectorList(int initialCapacity)	may not need, just data			
									public ControlVectorList()	may not need, just data			
									public ControlVectorList(Collection extends</td <td>may not need, just data</td> <td></td> <td></td> <td></td>	may not need, just data			
									Spline.ControlVector> collection)				

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
TRAJECTORY PARAMETERIZE	X	X	X	No				TrajectoryParam_calcStuffFwd.vi					
	X	Χ	Χ	No				TrajectoryParam_calcStuffRev.vi					
	X	Х		No				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.			
	X	X	X	No				TrajectoryParam_enforceVelocity.vi		This routines needs to be changed when new constraints are added.			

WPILib LabVIEW Math Library - VI Implementation List Revision 3.04 2/11/2023 – Added new pose est2 public static Trajectory timeParameterizeTrajectory(List<PoseWithCurvature> points. List<TrajectoryConstraint> constraints, double TrajectoryParam timeParam.vi startVelocityMetersPerSecond, double endVelocityMetersPerSecond, double maxVelocityMetersPerSecond, double
maxAccelerationMetersPerSecondSq, boolean reversed) Function Prototype ConstrainedState(PoseWithCurvature pose, double TRAJECTORY PARAMETERIZE CONSTRAINED STATE X ConstrainedState New.vi distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double maxAccelerationMetersPerSecondSq) ConstrainedState_SetMaxAccel.vi X X X X ConstrainedState SetMinAccel.vi ConstrainedState SetVelAccel.vi ConstrainedState SetVelocity.vi X X X X ConstrainedState() Function Prototype Notes TrajectoryUtil_fromPathWeaverJSON.vi TRAJECTORY UTIL X public static Trajectory fromPathweaverJson(Path path) Χ Χ TrajectoryUtil MakeWeightedWayPoint ENG.vi X X X X TrajectoryUtil_MakeWeightedWayPoint.vi X X X Χ X TrajectoryUtil_toPathWeaverJSON.vi public static void toPathweaverJson(Trajectory trajectory, Path public static Trajectory deserializeTrajectory(String json) public static String serializeTrajectory(Trajectory trajectory) VI Name Function Prototype Notes TRAPEZOID PROFILE X TrapProfConstraint New.vi X X X Χ Χ TrapProfile Calculate.vi Χ TrapProfile Direct.vi No Private, remove from menu X X X X TrapProfile Execute.vi TrapProfile Execute AtGoal.vi X X X X SI X X TrapProfile_IsFinished.vi Χ XX X TrapProfile New DefInitial.vi X X X X TrapProfile New.vi X TrapProfile_ShouldFlipAcceleration.vi No Private, remove from menu XX Χ TrapProfile TimeLeftUntil.vi XX Χ TrapProfile_TotalTime.vi TrapProfState Equals.vi XX X Χ TrapProfState New.vi '======== TRAJECTORY CONSTRAINT '======== Sample Program ecution Op rest Routine Not WPILIB

Function Prototype

Notes

RIPETAL ACCELERATION CONSTRAINT	\overline{X}	X		Χ	\neg		CentripetalAccelConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d	
								poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X			CentripetalAccelConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	Χ	Х		Χ	SI		CentripetalAccelConstraint_New.vi	public CentripetalAccelerationConstraint(double maxCentripetalAccelerationMetersPerSecondSq)	Can use cluster pack for now
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	pler	can	<i>5</i>	Menu	Execu	Sample			
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DIFF DRIVE KINEMATIC CONSTRAINT	X	X		X			DiffDriveKinematicsConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X			DiffDriveKinematicsConstraint_getMinMaxAccel.vi	public MinMax	
								getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X	\vdash	X	SI		DiffDriveKinematicsConstraint New.vi	public DifferentialDriveKinematicsConstraint(final	
							_	DifferentialDriveKinematics kinematics, double maxSpeedMetersPerSecond)	
	pet	ted.	9	-	Optimized	Program			
	Implemente	Documented	Not WPILIB	Menu Item	Execution Op	e)a			
	lmp	Оос	Not	Mer	Exec	San	VI Name	Function Prototype	Notes
DIFF DRIVE VOLTAGE CONSTRAINT	X	X		X			DiffDriveVoltageConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	Х	X		Х			DiffDriveVoltageConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
			\sqcup				DiffDriveVoltageConstraint_New.vi	public	
-	V		1	V	01			public	
-	X	X		X	SI		DIIIDIIVeVollageCollstraint_New.vi	DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double	
	<i>x</i>			X	SI		DIIIDIIVeVollageCollstraint_New.vi	DifferentialDriveVoltageConstraint(SimpleMotorFeedforward	
		, x		X	Mized		DIIIDIIVeVollageCollstraint_New.vi	DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double	
	χ ρε	Q	<u> </u>	X	ntimized	gram	DIIIDIIVeVoltageCollstraint_New.vi	DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double	
	nted	Q	ВПІ		Optimized	Program	DIIIDIIVeVoltageCollstraint_New.vi	DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double	
	nted	Q	WPILIB	Item	ution Optimized	mple Program	DIIIDIIVeVollageCollstraint_New.vi	DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double	
	Implemented X	Documented	Not WPILIB		ntimized	Sample Program	VI Name	DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double	Notes
ELLIPTICAL REGION CONSTRAINT	X Implemented	X Documented	Not WPILIB	X Menu Item	ution Optimized	Sample Program	VI Name EllipRegionConstraint_getMaxVelocity.vi	DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	Notes
	X X Implemented	X X Documented	Not WPILIB	X Menu Item	ution Optimized	Sample Program	VI Name EllipRegionConstraint_getMaxVelocity.vi EllipRegionConstraint_getMinMaxAccel.vi	DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	Notes
	X Implemented	X X Documented	Not WPILIB	X Menu Item	ution Optimized	Sample Program	VI Name EllipRegionConstraint_getMaxVelocity.vi	DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	Notes
	X X Implemented	X X Documented	Not WPILIB	X Wenu Item	ution Optimized	Sample Program	VI Name EllipRegionConstraint_getMaxVelocity.vi EllipRegionConstraint_getMinMaxAccel.vi EllipRegionConstraint_lsPoseInRegion.vi	DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	Notes
	X X Implemented	X X Documented	Not WPILIB	X Wenu Item	ution Optimized	Sample Program	VI Name EllipRegionConstraint_getMaxVelocity.vi EllipRegionConstraint_getMinMaxAccel.vi EllipRegionConstraint_lsPoseInRegion.vi	DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	Notes
	X X Implemented	X X Documented	Not WPILIB	X Wenu Item	otimized Execution Optimized	uram Sam	VI Name EllipRegionConstraint_getMaxVelocity.vi EllipRegionConstraint_getMinMaxAccel.vi EllipRegionConstraint_lsPoseInRegion.vi	DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	Notes
	X X Implemented	nted X X X Documented	JB Not WPILIB	X Wenu Item	otimized Execution Optimized	uram Sam	VI Name EllipRegionConstraint_getMaxVelocity.vi EllipRegionConstraint_getMinMaxAccel.vi EllipRegionConstraint_lsPoseInRegion.vi	DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	Notes
	X X Implemented	nted X X X Documented	ILIB	Item X X X Menu Item	ution Optimized Execution Optimized	uram Sam	VI Name EllipRegionConstraint_getMaxVelocity.vi EllipRegionConstraint_getMinMaxAccel.vi EllipRegionConstraint_lsPoseInRegion.vi	DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	Notes
	X X Implemented	nted X X X Documented	WPILIB	X Wenu Item	ution Optimized Execution Optimized	ole Program Sam	VI Name EllipRegionConstraint_getMaxVelocity.vi EllipRegionConstraint_getMinMaxAccel.vi EllipRegionConstraint_lsPoseInRegion.vi EllipRegionConstraint_New.vi	DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage) Function Prototype	
	Implemented X X X Implemented	X X Documented	Not WPILIB	Item X X X Menu Item	ution Optimized Execution Optimized	ole Program Sam	VI Name EllipRegionConstraint_getMaxVelocity.vi EllipRegionConstraint_getMinMaxAccel.vi EllipRegionConstraint_IsPoseInRegion.vi EllipRegionConstraint_New.vi	DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage) Function Prototype Function Prototype Function Prototype	Notes
	Implemented X X X Implemented	nted X X X Documented	WPILIB	Item X X X Menu Item	ution Optimized Execution Optimized	ole Program Sam	VI Name EllipRegionConstraint_getMaxVelocity.vi EllipRegionConstraint_getMinMaxAccel.vi EllipRegionConstraint_lsPoseInRegion.vi EllipRegionConstraint_New.vi	DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage) Function Prototype	

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			Not				Sa	VI Name	Function Prototype	Notes
MAX VELOCITY CONSTRAINT	X		 	X	SI	+		MaxVelocityConstraint_getMaxVelocity.vi		
	X		-	X	SI	+-	+	MaxVelocityConstraint_getMinMaxAccel.vi MaxVelocityConstraint_New.vi		
			\vdash	+^	- 31	+-	+	INAX V GIOCITY CONSTITUTING W.VI		
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MECANUM DRIVE KINEMATICS CONSTRAINT			—	X		+		MecaDriveKinematicsConstraint_getMaxVelocity.vi		
	X	X	\vdash	X	SI	+-		MecaDriveKinematicsConstraint_getMinMaxAccel.vi MecaDriveKinematicsConstraint_New.vi		
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RECTANGULAR REGION CONSTRAINT			—	X			_	RectRegionConstraint_getRectRegion.vi		
	X	X	_	X		_	+	RectRegionConstraint_getMinMaxAccel.vi RectRegionConstraint_IsPoseInRegion.vi		
	X	X	\vdash	X		_		RectRegionConstraint_Isi oserin egion.vi		
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	ηer	Documentea	WPILIB	Menu Item	Execution	Sou	le F			
	blei	כת	ž Z	nue	noe	st F	Sample			
			Not				Sa	VI Name		Notes
SWERVE DRIVE KINEMATICS CONSTRAINT	X	X		X				SwerveDriveKinematicsConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
		X		X				SwerveDriveKinematicsConstraint_getMinMaxAccel.vi	public MinMax	
	X	^			1				getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	^								1
						_		D: K C L: L		
	X			X	SI			SwerveDriveKinematicsConstraint_New.vi	Newpublic SwerveDriveKinematicsConstraint(final	Can use cluster pack for now
				X	SI			SwerveDriveKinematicsConstraint_New.vi		Can use cluster pack for now
				X				SwerveDriveKinematicsConstraint_New.vi	Newpublic SwerveDriveKinematicsConstraint(final SwerveDriveKinematics kinematics, double	Can use cluster pack for now
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	X	X	- TIB		Optimized		Program	SwerveDriveKinematicsConstraint_New.vi	Newpublic SwerveDriveKinematicsConstraint(final SwerveDriveKinematics kinematics, double	Can use cluster pack for now
	X	X	VPILIB		Optimized		ole Program	SwerveDriveKinematicsConstraint_New.vi	Newpublic SwerveDriveKinematicsConstraint(final SwerveDriveKinematics kinematics, double	Can use cluster pack for now
	X	X	ot WPILIB		Optimized		ample Program		Newpublic SwerveDriveKinematicsConstraint(final SwerveDriveKinematics kinematics, double maxSpeedMetersPerSecond)	
	Implemented X	Documented	Not	Menu Item	Execution Optimized	, ue	eldui	VI Name	Newpublic SwerveDriveKinematicsConstraint(final SwerveDriveKinematics kinematics, double maxSpeedMetersPerSecond)	Can use cluster pack for now
TRAJECTORY CONSTRAINT	X	X Documented	X	X Menu Item	Execution Optimized		Sample Program		Newpublic SwerveDriveKinematicsConstraint(final SwerveDriveKinematics kinematics, double maxSpeedMetersPerSecond)	

Revision 3.04 2/11/2023 – Added new pose est2

'===== UTILITY '======

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
UTIL	Χ	Χ	Χ	Χ	SI		Util_ApproxEqual.vi	
	Χ	Χ	Χ	Χ			Util_Array_PoseWCurv_to_XY.vi	
	Χ	Χ	Χ	Χ	SI		Util_CalcDist.vi	
	Χ	Χ	Χ	Χ	SI		Util_GetLibraryVersion.vi	
	Χ	Χ	Χ	Χ	SI		Util_GetLibUsage.vi	
	X	X	X	X			Util_GetTime.vi	Once tested completely, this sho be optimized!
	Χ	Х	Χ	No	I		Util_GetTime_U32.vi	
	Χ	X	Χ	No	1		Util_GetTime_U64.vi	
	Χ	Χ	Χ	No	N/A		Util_LibraryGlobals.vi	Global Variables – no block diag
	Χ	Χ	Χ	Χ			Util_Trajectory_Absolute_To_Relative.vi	
	Χ	Χ	Χ	Χ			Util_Trajectory_ReadFile.vi	
	Χ	Χ	Χ	Χ			Util_Trajectory_to_XY.vi	
	Χ	Χ	Χ	No			Util_Trajectory_WriteFile_Config.vi	internal
	Χ	Χ	Χ	No			Util_Trajectory_WriteFile_OneState.vi	internal
	Χ	Χ	Χ	Χ			Util_Trajectory_WriteFile_PathFinder.vi	
	Χ	Χ	Χ	No			Util_Trajectory_WriteFile_PathFinderConfig.vi	internal
	Χ	Χ	Χ	Χ			Util_Trajectory_WriteFile_Pathweaver.vi	
	Χ	Χ	Χ	No			Util_Trajectory_WriteFile_States.vi	internal
	Χ	Χ	Χ	No			Util_Trajectory_WriteFile_WayPoints.vi	internal
	Χ	Χ	Χ	Χ			Util_Trajectory_WriteFile.vi	
	Χ	Χ	Χ	Χ			Util_TrajectoryState_Meters_To_Inches.vi	
	Χ	Χ	Χ	Χ			Util_TrajState_to_DiffDrive_WheelPos.vi	
	Χ	Χ	Χ	Χ			Util_DispWaypoint_Eng_To_SI.vi	
	Χ	Χ	Χ	Χ			Util_DispWaypoint_To_CubicInput.vi	
	Χ	Χ	Χ	Χ			Util_DispWaypoint_To_QuinticInput.vi	
	Χ	Χ	Χ	Χ			Util_DispWeightedWaypiont_Eng_To_WeightedWaypoint	
	Χ	Χ	Χ	No			Util_DispWeightedWayPoint_To_WeightedWayPoint.vi	Sorry about the confusing name.

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CONVERSIONS

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

JAVA / C++ WPILIB EQUIVALENT

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

Revision 3.04 2/11/2023 – Added new pose est2

X	Χ	X	Χ	SI	Conv_GyroDegrees_Heading.vi	
X	Χ	X	Χ	SI	Conv_Heading_AngleRadians.vi	
X	Χ	X	Χ	SI	Conv_Inches_Meters.vi	
X	Χ	Χ	X	SI	Conv_Kilograms_Pounds.vi	
X	Χ	X	Χ	SI	Conv_Meters_Feet.vi	
X	Χ	Χ	X	SI	Conv_Meters_Inches.vi	
X	Χ	X	Χ	SI	Conv_Pose2d_SI_Eng.vi	
X	Χ	Χ	Χ	SI	Conv_Pounds_Kilograms.vi	
X	Χ	X	Χ	SI	Conv_Radians_Deg.vi	
X	Χ	X	Χ	SI	Conv_Radians_Rotations.vi	
X	Χ	X	Χ	SI	Conv_Rotations_Deg.vi	
X	Χ	X	Χ	SI	Conv_Rotations_Radians.vi	
X	Χ	X	Χ	SI	Conv_Yards_Meters.vi	

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

'===== PATHFINDER UTIL

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	,
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'======== STATE SDACE MC

STATE SPACE MODEL

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
DC MOTOR	X	X		Χ	SI		DCMotor_GetAndymark9015.vi					
	Χ	Χ			SI		DCMotor_GetAndymarkAM2235A.vi					
	Χ	Χ			SI		DCMotor_GetAndymarkAM3493.vi					
	Χ	Χ		Χ	SI		DCMotor_GetAndymarkAM3493.vi DCMotor_GetAndymarkRs775_125.vi					
	Χ	Χ		Χ	SI		DCMotor_GetBag.vi					

X	Χ	\ \ \ \ \ \	SI	DCMotor_GetBanebotsRs550.vi
X	Χ	\ \ \ \ \ \ \		DCMotor_GetBanebotsRs775.vi
X	Χ)		DCMotor_GetCIM.vi
X	Χ	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	SI	DCMotor_GetCurrent.vi
X	Χ	\ \ \ \ \ \	SI	DCMotor_GetFalcon500.vi
X	Χ	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		DCMotor_GetMiniCIM.vi
X	Χ	\ \ \ \ \ \		DCMotor_GetNEO.vi
X	Χ)		DCMotor_GetNEO550.vi
X	Χ	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	SI	DCMotor_GetRomiBuiltIn.vi
X	Χ		SI	DCMotor_GetSpeed.vi
X	Χ		SI	DCMotor_GetTorque.vi
X	Χ	\ \ \ \ \ \		DCMotor_GetVex775Pro.vi
X	Χ)		DCMotor_New.vi
X	Χ	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	SI	DCMotor_PickMotor.vi
X	Χ		SI	DCMotor_WithReduction.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 ID	X	X		X				LinearSystemId_CreateDCMotorSystem.vi					
	X	X		X				LinearSystemId_CreateDriveTrainVelocitySystem.vi		Update to use create matrix			
	X	X		X				LinearSystemId_CreateElevatorSystem.vi		Update to use create matrix			
	X	X		X				LinearSystemId_CreateFlywheelSystem.vi		Update to use create matrix			
	X	X		X				LinearSystemId_CreateSingleJointedArmSystem.vi		Update to use create matrix			
	Χ	X		X				LinearSystemId_IdentifyDriveTrainSystem.vi		Update to use create matrix			
	X	X		X				LinearSystemId_IdentifyPositionSystem.vi		Update to use create matrix			•
	X	X		X				LinearSystemId_IdentifyVelocitySystem.vi		Update to use create matrix			•

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE POSE ESTIMATOR	Χ	Χ		X				DiffDrivePoseEst_AddVisionMeasurement.vi					
	Χ	Χ		X				DiffDrivePoseEst_FillStateVector.vi					
	Χ	Χ		X				DiffDrivePoseEst_GetEstimatedPosition.vi					
	Χ	Χ		X				DiffDrivePoseEst_Kalman_F_Callback.vi					
	Χ	Χ		X				DiffDrivePoseEst_Kalman_H_Callback.vi					
	Χ	Χ		X				DiffDrivePoseEst_New.vi					
	Χ	Χ		X				DiffDrivePoseEst_ResetPosition.vi					
	Χ	Χ		X				DiffDrivePoseEst_SetVisionMeasurementStdDevs.vi					
	Χ	Χ		X				DiffDrivePoseEst_Update.vi					
	Χ	Χ		X				DiffDrivePoseEst_UpdateWithTime.vi					
	Χ	Χ		X				DiffDrivePoseEst_VisionCorrect_Callback.vi					
	X	Χ		X				DiffDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi					

Function Prototype Notes DiffDrivePoseEst2_AddVisionMeasurement.vi
DiffDrivePoseEst2_BufferDuration.vi
DiffDrivePoseEst2_GetEstimatedPosition.vi
DiffDrivePoseEst2_InterpRecord_ExtractFromVar.vi X NO SI

DIFFERENTIAL DRIVE POSE ESTIMATOR 2 X X X X X

	X				DiffDrivePoseEst2_InterpRecord_Interp.vi					
	X				DiffDrivePoseEst2_InterpRecord_New.vi					
	X				DiffDrivePoseEst2_New.vi					
	X				DiffDrivePoseEst2 ResetPosition.vi					
	X				DiffDrivePoseEst2 SetVisionMeasurementStdDevs.vi					
	X				DiffDrivePoseEst2_Update.vi					
	X				DiffDrivePoseEst2 UpdateWithTime.vi					
	7.				Bill Bill of Coolest _ Openio Will Tillio. Vi					
	mplemented Oocumented		Menu Item Execution Optimized	Test Routine	Nample Program			Code Review	Test Program	rror Checking
	_ <u>2</u> _ Q			<u> </u>		Function Prototype	Notes	Ŭ	<u> </u>	Ü
EXTENDED KALMAN FILT			X		ExtendedKalmanFilter_Correct_OnlyUY.vi					
	XX		Χ		ExtendedKalmanFilter_Correct.vi		Just a shell, not functional!			
	XX		X		ExtendedKalmanFilter_GetP_Single.vi					
	XX		X		ExtendedKalmanFilter_GetP.vi					
	XX		Χ		ExtendedKalmanFilter_GetXHat_Single.vi					
	XX		X		ExtendedKalmanFilter GetXHat.vi					
	XX		X		ExtendedKalmanFilter New.vi					
	$\begin{array}{c c} X & X \\ \hline X & X \end{array}$		X		ExtendedKalmanFilter Predict.vi					
	$\begin{array}{c c} x & x \\ \hline x & x \end{array}$		X		ExtendedKalmanFilter Reset.vi	+				
	$\begin{array}{c c} X & X \\ \hline X & X \end{array}$		X		ExtendedKalmanFilter SetP.vi					
	$\begin{array}{c c} X & X \\ X & X \end{array}$		X		ExtendedKalmanFilter_SetP.vl ExtendedKalmanFilter_SetXHat_Single.vi					
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	XX		X		ExtendedKalmanFilter_SetXHat.vi					
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	mplemented Jocumented	Vot WPILIB	Menu Item Execution Opti	Test Routine	Sample Programme All Name	Function Prototype	Notes	Sode Review	Test Program	Error Checkinę
KALMAN FILT	_ =	Not W	Menu Execu		ଞ୍ଚି VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILT	TER X X		X	X Test Routine	ଓ VI Name KalmanFilter_Correct.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILT	TER		X X		VI Name KalmanFilter_Correct.vi KalmanFilter_GetK	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILT	X		X X X		VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILT	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	Function Prototype	Notes	Code Review	Test Program	Error Checking
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KALMAN FILT	X		X X X X X X	X	VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHaT_Single KalmanFilter_New.vi KalmanFilter_Predict.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILT	X		X	X	VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_New.vi KalmanFilter_Predict.vi KalmanFilter_Reset.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILT	X		X	X X X	VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHaT_Single KalmanFilter_New.vi KalmanFilter_Predict.vi KalmanFilter_Reset.vi KalmanFilter_SetXHat	Function Prototype	Notes	Code Review	Test Program	Error Checking
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IECANUM DRIVE POSE ESTIMATOR	_			 -	 -			MecaDrivePoseEst AddVisionMeasurement StdDev.vi	i unction i rototype	Notes			
IECANUM DRIVE POSE ESTIMATOR			-										
	X		\longrightarrow	X	_			MecaDrivePoseEst_AddVisionMeasurement.vi					
	X	_X_	1	X				MecaDrivePoseEst_GetEstimatedPosition.vi					
		X		No	$\overline{}$			MecaDrivePoseEst_Kalman_F_Callback.vi					
		X	\longrightarrow	No				MecaDrivePoseEst_Kalman_H_Callback.vi					
		X	 	X				MecaDrivePoseEst_New.vi					
	X		<u> </u>	Χ				MecaDrivePoseEst_ResetPosition.vi					
	X		1	Χ				MecaDrivePoseEst_SetVisionMeasurementStdDevs.vi					
	X		1	Χ				MecaDrivePoseEst_Update.vi					
	X			Χ				MecaDrivePoseEst_UpdateWithTime.vi					
	Χ			No				MecaDrivePoseEst_VisionCorrect_Callback.vi					
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		Χ		Χ				SwerveDrivePoseEst_Kalman_H_Callback.vi					
	X	_ X_ '		X				SwerveDrivePoseEst_New.vi					
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		X	X			UnscentedKalmanFilter_SetXHat_Single.vi					
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		X	X			LinearPIntInvFF_GetR_Single.vi				
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		X	X			LinearPIntInvFF_GetUff_Single.vi				
	X	X	X	(LinearPIntInvFF_GetUff.vi				
	X	X	X	(LinearPIntInvFF_New_Plant.vi				
		X	X			LinearPIntInvFF_New.vi				
		X	X			LinearPIntInvFF_Reset_Initial.vi				
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	Y	X	X		X	LinearQuadraticRegulator_GetK.vi		NOT ORIGINAL		
		X	X			LinearQuadraticRegulator_GetR_Single.vi				
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	X	X	X	(LinearQuadraticRegulator_GetU_Single.vi				
		X	X			LinearQuadraticRegulator_GetU.vi				
	Χ	X	X		X	LinearQuadraticRegulator_LatencyCompensate.vi		Routine exists, but it only has		
	Y	X	X	,		LinearQuadraticRegulator_New_ELMS.vi		interger raise matrix to power.		
	X	X	X			LinearQuadraticRegulator_New_N.vi				
						LinearQuadraticRegulator_New_Raw.vi				
		X	X		X	LinearQuadraticRegulator_New_SystemELMS.vi				
	X	X	X			LinearQuadraticRegulator_New.vi				
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LINEAR SYSTE			X			LinearSystem_CalculateX.vi				
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	X	X	X			LinearSystem_GetDElement.vi LinearSystem_New.vi				

Revision 3.04 2/11/2023 – Added new pose est2 Function Prototype VI Name Notes LINEAR SYSTEM LOOP X X LinearSystemLoop ClampInput.vi X LinearSystemLoop Correct.vi LinearSystemLoop GetClampFunction.vi XX Χ LinearSystemLoop GetController.vi LinearSystemLoop GetError Single.vi XX Χ LinearSystemLoop_GetError.vi XX Χ XX Χ LinearSystemLoop_GetFeedForward.vi X X X LinearSystemLoop GetNextR Single.vi Χ LinearSystemLoop GetNextR.vi Χ LinearSystemLoop_GetObserver.vi XX Χ XX Χ LinearSystemLoop GetU Row.vi XX LinearSystemLoop GetU.vi Χ LinearSystemLoop_GetXHat_Single.vi XX X XX LinearSystemLoop GetXHat.vi Χ LinearSystemLoop New BBB LinearSystemLoop New LinearSystem ClampFunc XX Χ LinearSystemLoop New LinearSystem ClampVal.vi XX Χ LinearSystemLoop New.vi LinearSystemLoop_Predict.vi XX Χ XX LinearSystemLoop_Reset.vi Χ LinearSystemLoop_SetClampFunction.vi LinearSystemLoop SetNextR Some.vi XX LinearSystemLoop_SetNextR.vi Χ LinearSystemLoop SetXHat Single.vi LinearSystemLoop SetXHat.vi Function Prototype Notes LTV DIFFERENTIAL DRIVE CONTROLLER X LTVDiffDriveCtrl Calculate.vi Χ X LTVDiffDriveCtrl New.vi X X _TVDiffDriveCtrl Calculate TraiState.vi X LTVDiffDriveCtrl_Calculate_SetTolerance.vi XX Χ LTVDiffDriveCtrl Calculate AtReference.vi Not WPILIB Function Prototype Notes LTV UNICYCLE CONTROLLER X X LTVUnicycleCtrl_AtReference.vi Χ $X \mid X$ X Χ LTVUnicycleCtrl_Calculate_TrajState.vi X X LTVUnicycleCtrl Calculate.vi X X Χ Χ LTVUnicycleCtrl New.vi LTVUnicycleCtrl_SetEnabled.vi Χ Χ X X LTVUnicycleCtrl SetTolerance.vi '======== STATE SPACE UTILITIES '========

Revision 3.04 2/11/2023 – Added new pose est2 VI Name Function Prototype Notes CallbackHelp MatrixMinus.vi CALLBACK HELPER X X X X X X X X X X X X X X X X X CallbackHelp MatrixMult CoerceSizeB.vi CallbackHelp MatrixMult.vi CallbackHelp MatrixPlus.vi Function Prototype Notes DISCRETIZATION X X X X Discretization DiscretizeA.vi Discretization DiscretizeAB.vi $X \mid X$ Χ Χ XX Discretization_DiscretizeABTaylor.vi Χ X Χ Discretization DiscretizeAQ.vi Χ Χ X X X X X Discretization DiscretizeAQTaylor.vi Χ X Χ Discretization DiscretizeR.vi Function Prototype Notes STATE SPACE UTIL X StateSpaceUtil_Check_Stabalizable.vi Internal routine No X X X X X X X X X X X X Χ StateSpaceUtil ClampInputMaxMagnitude.vi Routine exists, it is just a shell Χ StateSpaceUtil_IsDetectable.vi Χ StateSpaceUtil_IsStabalizable.vi X X X X X X X X X X Χ StateSpaceUtil MakeCostMatrix.vi StateSpaceUtil MakeCovarianceMatrix.vi Χ X StateSpaceUtil MakeWhiteNoiseVector.vi X X X X Χ StateSpaceUtil NomalizeInputVector.vi StateSpaceUtil_PoseTo3dVector.vi X XX StateSpaceUtil PoseTo4dVector.vi Χ StateSpaceUtil PoseToVector.vi Χ '======= SIMULATION '======= Function Prototype Notes BATTERY SIM X SI BatterySim CalculateDefaultBatteryLoadedVoltage.vi Χ X BatterySim_CalculateLoadedVoltage.vi X SI Execution Op Fest Routine Not WPILIB Function Prototype Notes

- Added new pose est2									_				
DC MOTOR SIM	Χ	X		X				DCMotorSim_getAngularPositionRad.vi					
		X		X				DCMotorSim_getAngularPositionRotations.vi					
		X		X				DCMotorSim_getAngularVelocityRadPerSec.vi			$\overline{}$		
	X			X				DCMotorSim_getAngularVelocityRPM.vi			-		
	\overline{X}			X				DCMotorSim_GetCurrentDrawAmps.vi			-		
	\overline{x}			X				DCMotorSim New MOI.vi			+		
	$\frac{\lambda}{X}$			X				DCMotorSim New Plant.vi				+	
	\dot{X}			$\frac{\lambda}{X}$		_		DCMotorSim_SetInputVoltage.vi			\longrightarrow		
		$\frac{1}{X}$		$\frac{\lambda}{X}$							\longrightarrow		
		├^	_	^			1	DCMotorSim_Update.vi					
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DITTERENTIAL DRIVE TRAIN OIM		$\frac{\lambda}{X}$		X				DiffDriveTrainSim_CreateKitbotSim_EstMass.vi			$\overline{}$		
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-	X			$\frac{\lambda}{X}$							\longrightarrow		
							1	DiffDriveTrainSim_CreateKitbotSim.vi					
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	X			X			1	DiffDriveTrainSim_GetCurrentGearing.vi					
ļ	X			X			1	DiffDriveTrainSim_GetDynamics.vi					
	X			X				DiffDriveTrainSim_GetHeading.vi					
	X			X			1	DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi					
	Χ			X				DiffDriveTrainSim_GetLeftPositionMeters.vi					
	Χ			X				DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi					
	Χ	X		X				DiffDriveTrainSim_GetOutput_Single.vi					
	X	X		X				DiffDriveTrainSim_GetPose.vi					
	Χ	X		X				DiffDriveTrainSim_GetRightCurrentDrawAmps.vi					
	Χ	X		X				DiffDriveTrainSim_GetRightPositionMeters.vi					
	X	X		X				DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi					
	Χ			X				DiffDriveTrainSim_GetState_Single.vi					
	Χ			X				DiffDriveTrainSim GetState.vi					
	Χ			X				DiffDriveTrainSim KitBotWheelSize.vi					
	Х			X				DiffDriveTrainSim New Mass MOI.vi					
	X			X				DiffDriveTrainSim New.vi			-		
	\overline{x}			X				DiffDriveTrainSim_SetCurrentGearing.vi			-		
	X	_		X				DiffDriveTrainSim_SetInputs.vi			-		
	\overline{x}			X				DiffDriveTrainSim SetPose.vi					
	X			$\frac{\lambda}{X}$				DiffDriveTrainSim_SetFose.vi					
				$\frac{\lambda}{X}$									
-	X	X						DiffDriveTrainSim_ToughBoxMiniGearRatio.vi					
-	X	X		X				DiffDriveTrainSim_ToughBoxMiniMotor.vi			\longrightarrow		
-	Χ	X		X				DiffDriveTrainSim_Update.vi			\longrightarrow		
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	$\frac{1}{2}$	X		X				ElevatorSim GetVelocityMetersPerSecond.vi			+		
	$\hat{}$	$\frac{1}{X}$		$\frac{\lambda}{X}$				ElevatorSim_HasHitLowerLimit.vi					
	÷	$\frac{\hat{x}}{x}$		$\frac{\lambda}{X}$				ElevatorSim_HasHitUpperLimit.vi			\longrightarrow		
	^	^	-	^			1						
			+		+		1	ElevatorSim_New_LinSys_NoNoise.vi					
		-	-		1		1	ElevatorSim_New_LinSys.vi					
			-	-			1	ElevatorSim_New_NoNoise.vi					
-	X	X	+.	X			1	ElevatorSim_New.vi					
			χ				1	ElevatorSim_RKF45_Func.vi					
	Χ	X		X			1	ElevatorSim_SetInputVoltage.vi					
	Χ			X				ElevatorSim_SetState.vi					
	X	X	X	X				ElevatorSim_Update.vi		Needed because this doesn't			
-			_	-			1			extend.			
	X	X		X				ElevatorSim_UpdateX.vi					

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	Χ	X		X			ElevatorSim_WouldHitLowerLimit.vi					
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FLYWHEEL SIM				X			FlyWheelSim_GetAngularVelocityRAuFetSec.vi			+		
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							FlyWheelSim_New_LinSys		Future	+		
							FlyWheelSim_New_LinSys_MOI_NoNoise		Future	+		
							FlyWheelSim_New_LinSys_NoNoise		Future			
	X			X			FlyWheelSim_New_MOI.vi					
	Χ	X		X			FlyWheelSim_SetInput.vi					
	Χ	X		X			FlyWheelSim_SetState.vi					
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X	X			SI			Matrix_Transpose.vi					
X	X	X	X				Matrix_WithinTolerance.vi					
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Revision 3.04 2/11/2023 – Added new pose est2 Function Prototype Notes NOTE Matrix also has an ExtractMatrix with different calling parameters.... YUK. SIMPLE MATRIX X SimpleMatrix ExtractMatrix.vi Function Prototype Notes MATRIX HELPER X MatrixHelper_CooerceSize.vi SI X X X X SI MatrixHelper MultCooerceBSize.vi X X X X SI MatrixHelper Zero.vi Function Prototype Notes VECTOR BUILDER X X VecBuilder_1x1Fill.vi SI X X X X X X X X X X X X X SI VecBuilder_2x1Fill.vi VecBuilder_3x1Fill.vi VecBuilder_4x1Fill.vi X SI X SI X SI VecBuilder_5x1Fill.vi XX X SI VecBuilder 6x1Fill.vi X X X SI VecBuilder 7x1Fill.vi VecBuilder_8x1Fill.vi XX X SI VecBuilder_9x1Fill.vi VecBuilder 10x1Fill.vi X X X X SI VecBuilder ArrayBy1Fill.vi Function Prototype Notes VECTOR X X Vector Dot.vi SI Χ Χ Si Vector Norm.vi '======== MATH '======= Function Prototype Notes AngleStats_AngleAdd_CallbackHelp.vi

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Revision 3.04 2/11/202

Added new pose est2													
	X	X		X				NumIntegrate_Rkf45_Mat_X_U.vi		Note that this Feinberg method has been changed and a Dormand Price method has been			
			\vdash					NumIntegrate_RKf45_New.vi		implemented TODO Removed. Never used.			
	Χ	X	X	X	(3	SI		NumIntegrate_Trap_Dbl.vi					
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RUNGE KUTTA TIME VARYING	X Implemented	X Documented	Not WPILIB	Menu ttem		Execution Optimized	Test Routine	VI Name RungeKuttaTimeVarying_RK4_Mat_T_Y.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
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	ented	ented	ыгів	<i>E</i>		on Optimized	outine	ie Program			Review	rogram	Checking
COMPUTER VISION UTILITIES	X Implementea	X Documentea	Not WPILIB	X Menu Item	, L	Execution	Test Routine	VI Name CompVisionUtil CalculateDistanceToTarget.vi	Function Prototype	Notes	Code		Test
OMPUTER VISION UTILITIES		X X X X X		X X X X X		Executi	Test R.	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	Test P	

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

Revision 3.04 2/11/2023 – Added new pose est2 Function Prototype Notes VI Name APRIL TAG X SI AprilTag_Equals.vi X X SI AprilTag GetAll.vi X SI AprilTag_New.vi Function Prototype Notes APRIL TAG FIELD LAYOUT X X X SI AprilTagFieldLayout_GetField.vi X SI X SI AprilTagFieldLayout_GetOriginPosition.vi AprilTagFieldLayout_GetTagPose.vi X SI X SI AprilTagFieldLayout_GetTags.vi AprilTagFieldLayout_New.vi X SI AprilTagFieldLayout_New2022.vi XX X SI AprilTagFieldLayout_New2023.vi AprilTagFieldLayout_NewSelect.vi XX X SI AprilTagFieldLayout_SetOrigin.vi
AprilTagFieldLayout_SetOrigin_Position.vi X SI XX X SI Function Prototype Notes APRIL TAG POSE ESTIMATE X X X AprilTagPoseEstimate GetAll.vi SI X SI AprilTagPoseEstimate_GetAmbiguity.vi XX AprilTagPoseEstimate New.vi X SI '======== COMMUNICATIONS '======== Function Prototype VI Name Notes NETWORK UDP X NetworkUDP Close.vi $X \mid X$ X SI X X X X I NetworkUDP Receive.vi X X X X I NetworkUDP Send.vi '========

TYPE DEFINITIONS '========

	Implemented	Documented	WPILIB	Item	on Optimized	Routine	Program	
	leme	гите	, WP	nu It	Execution	st Ro	ຍ ເ ເ ຮ VI Name Function Prototype	
,			Not	Menu		Test		Notes
TypeDef		Z	X	X			AprilTag.ctl	
	Z	Z Z	X	X	N/A N/A		AprilTagFieldLayout,ctl AprilTagFieldLayoutOriginPosition_ENUM.ctl	
	Z	Z	X	X	N/A		AprilTagFields ENUM.ctl	
	Ζ	Z	Х	X			AprilTagPoseEstimate.ctl	
	Ζ	Ζ	Χ	X			ARM_FF.CTL	
	Z	Z	X	X	N/A		BANG_BANG.CTL	NOT HOED, OL THE L
	'		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	4515454 51 42411441154111
	Ζ	Z	Χ	X	N/A		CHASSIS_SPEEDS.CTL	
	Z Z	<u>Z</u> <u>Z</u>	X	X			CONTRAINED_STATE.CTL COORDINATE AXIS.CTL	
	Z	Z	X		N/A N/A		COORDINATE_AXIS.CTL COORDINATE SYSTEM.CTL	
	Z	Z	X	X			DCMOTOR_SIM.CTL	
	Ζ	Ζ	Χ	Χ	N/A		DCMOTOR_TYPES_ENUM.CTL	
	Z	Z	X	X			DCMOTOR.CTL	
		<u>Z</u> <u>Z</u>	X		N/A N/A		DEBOUNCER_TYPE_ENUM.Ctl DEBOUNCER.CTL	
	Z	Z	X	X			DIFF DRIVE ACCEL LIMIT.CTL	
	Z	Z	X	X	N/A		DIFF DRIVE KINEMATICS.CTL	
	Ζ	Ζ	Χ	Χ			DIFF_DRIVE_Kitbot_WheelSize_ENUM.ctl	
	Ζ	Z	Χ		N/A		DIFF_DRIVE_ODOM2.ctl	
	Z	Z	X	X	N/A		DIFF_DRIVE_Pose_EST.ctl	
			X		N/A N/A		DIFF_DRIVE_POSE_EST2.ctl DIFF_DRIVE_POSE_EST2_INTERP_RECORD.CTL	
	Z	Z	X	X	N/A		DIFF_DRIVE_FOSE_ES12_INTERF_RECORD.CTL DIFF_DRIVE_ToughBoxMini_GearChoice_ENUM.ctl	
	Z	Z	X	X			DIFF DRIVE ToughBoxMini MotorChoice ENUM.ctl	
	Ζ	Ζ	Χ	Χ	N/A		DIFF_DRIVE_TRAIN_SIM_STATE_ENUM.CTL	
	Z	Z	X	X	N/A		DIFF_DRIVE_TRAIN_SIM.ctl	W. LITH WAYDONT V
	Z	Z	X	X	NA NA		DISPLAY_WAYPOINT.ctl DISPLAY_WEIGHTED_WAYPOINT.ctl	Was UTIL_WAYPOINT.VI New V1.5. was
	_	_	^	^	/\/\		DISTERT_WEIGHTED_WATTOINT.GU	UTIL_WEIGHTED_WAYPOINIT.VI
	Z	Z	X	X	N/A		ELEV_FF.CTL	
	Ζ	Ζ	Χ		N/A		ELEVATOR_SIM.CTL	
	Z	Ζ	X		N/A		EXTENDED_KALMAN_CORRECT_FUNC_GROUP.CTL	
	Z Z	Ζ	X		N/A N/A		EXTENDED_KALMAN_FILTER.CTL FLYWHEEL SIM.ctl	
	Z	Z		X			FUNCTION_GENERATOR_MATRIX.ctl	
	Z	Z	X		N/A		FUNCTION GENERATOR.ctl	
	Ζ	Ζ	X	Χ	N/A		HOLONOMIC_DRV_CTRL.CTL	New 1/26/21
	Z	Z	X		N/A		KALMAN_FILTER_LATENCY_COMP_FUNC_GROUP.CTL	
	Z Z	<i>Z</i>	X		N/A N/A		KALMAN_FILTER_LATENCY_COMP.CTL KALMAN_FILTER.ctl	
	Z	Z Z	X		N/A N/A		LINEAR FILTER.CTL	
	Z	Z	X		N/A		LINEAR_PLANT_INV_FF.ctl	
	Ζ	Ζ	Χ	Χ	N/A		LINEAR_QUADRATIC_REGULATOR.ctl	
	Z	Z	X		N/A		LINEAR_SYSTEM_LOOP.ctl	
	Z	Z	X		N/A		LINEAR_SYSTEM_SIM.ctl	
	Z	Z	X	X	N/A N/A		LINEAR_SYSTEM.ctl LTV DIFF DRIVE CTRL STATE ENUM.ctl	
	Z	Z	X		N/A		LTV DIFF DRIVE CTRL.ctl	
	N/A		N/A		N/A		LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl	OBSOLETE – Removed
	Z	Z	Χ		N/A		LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl	
	Z	Z	X		N/A		LTV_UNICYCLE_CONTROLLER.CTL	
	Z Z	<i>Z</i>	X		N/A N/A		MECA_DRIVE_KINEMATICS.CTL MECA_DRIVE_ODOMETRY.CTL	
	Z	Z Z	X	X	N/A		MECA_DRIVE_ODOMETRY.CTL MECA_DRIVE_POSE_EST.CTL	
	Z	Z	X		N/A		MECA_WHEEL_POSITIONS.CTL	
	Ζ	Ζ	Χ	Χ	N/A		MECA_WHEEL_SPEEDS.CTL	
	Ζ	Z	Χ		N/A		MEDIAN_FILTER.CTL	
	Ζ	Z	Χ	X	N/A		MERWE_SCALED_SIGMA_PTS.ctl	

Z	Ζ	X	X	N/A	OBSERVER SNAP LIST ITEM.CTL	
Z	Ζ	X	Χ	N/A	OBSERVER SNAPSHOT.CTL	
Z	Z	X	X	N/A	PARAM STACK ITEM.CTL	
Z	Z	X	X	N/A	PARAM STACK.CTL	
Z	Z	X	\overline{X}	N/A	PID ADV LIMITS.CTL	
Z	Z	X	X	N/A	PID_ADV_TUNING.CTL	
Z	Ζ	Χ	X	N/A	PID_CONTROLLER.CTL	
Z	Ζ	X	Χ	N/A	PID_ERROR_TOLERANCE.CTL	
Z	Ζ	X	X	N/A	PID INPUT LIMITS.CTL	
Z	Ζ	X	X	N/A	PID TUNING.CTL	
Z	Ζ	X	Χ	N/A	POSE2D.CTL	
Z	Z	X	X	N/A	POSE3D.CTL	
Z	Z	X	X	N/A	POSEwCURVATURE.CTL	
		-		N/A		
Z	Z	X	X		PROFILED_PID_CONTROLLER.CTL	
Z	Z	X	X	N/A	QUATERNION.CTL QUATERNION.CTL	
Z	Ζ	X	Χ	N/A	RAMSETE_EXE_TUNING.CTL	
Z	Ζ	X	Χ	N/A	RAMSETE.CTL	
Z	Ζ	X	X	N/A	ROTATION2D.CTL	
Z	Ζ	Χ	Χ	N/A	ROTATION3D.CTL	
Z	Z	Χ		N/A	SIMPLE MOTOR FF KA TUNE PARAMS.CTL	
Z	Z	X	X	N/A	SIMPLE MOTOR FF.CTL	
Z	Z	X	\overline{X}	N/A	SINGLE JOINT ARM SIM.CTL	
					SLEW RATE LIMITER.CTL	
Z	Z	X	X	N/A		
Z	Z	X	X	N/A	SPLINE_CTRL_VECTOR.CTL	
_ Z	<u> </u>	X	Χ	N/A	SPLINE.CTL SPLINE.CTL	
Z	Ζ	Χ	Χ	N/A	SWERVE_DRIVE_KINEMATICS.CTL	
Z	Ζ	X	Χ	N/A	SWERVE_DRIVE_MODULE_POSITION.CTL	
Z	Ζ	X	X	N/A	SWERVE DRIVE MODULE STATE.CTL	
Z	Ζ	X	Χ	N/A	SWERVE DRIVE ODOMETRY.CTL	
Z	Ζ	X	Χ	N/A	SWERVE DRIVE Pose EST.CTL	
Z	_	Χ		N/A	SWERVE DRIVE POSE EST2.ctl	
Z		X		N/A	SWERVE DRIVE POSE EST2 INTERP RECORD.CTL	
Z	Z	X	X	N/A	TIME INTERPOLATABLE BOOLEAN.CTL	
		X		N/A	TIME INTERPOLATABLE DOUBLE.CTL	
Z	Z		X			
Z	Z	X	X	N/A	TIME_INTERPOLATABLE_POSE2D.CTL	
Z	Ζ	X	Χ	N/A	TIME_INTERPOLATABLE_ROTATION2D.CTL	
Z	Ζ	Χ		N/A	TIME_INTERPOLATABLE_VARIANT.CTL	
Z	Ζ	X	X	N/A	TIMER.CTL	
Z	Ζ	X	Χ	N/A	TRAJ_CONFIG.CTL	
Z	Ζ	X	Χ	N/A	TRAJ_CONSTRAINT_CENTRIPETAL_ACCEL.CTL	
Z	Ζ	X	X	N/A	TRAJ_CONSTRAINT_DIIF_DRIVE_KINEMATICS.CTL	
Z	Ζ	X	X	N/A	TRAJ CONSTRAINT DIIF DRIVE VOLTAGE.CTL	
Z	Ζ	Χ	Χ	N/A	TRAJ CONSTRAINT ELLIP REGION.CTL	
1		X		N/A	TRAJ CONSTRAINT JERK.CTL	Routine exists, it is just a shell
Z	Ζ	X	Χ	N/A	TRAJ CONSTRAINT MAX VELOCITY.CTL	rteamine exister, it is just a erien
		X			TRAJ_CONSTRAINT_WRAZ_VEEOSITT.STE TRAJ_CONSTRAINT_MECA_DRIVE_KINEMATICS.CTL	
Z	Z	X	X	N/A	TRAJ CONSTRAINT MINMAX.CTL	
Z	<u>Z</u>	X	X	N/A	TRAJ_CONSTRAINT_RECT_REGION.CTL TRAJ_CONSTRAINT_SWERVE_DRIVE_KINEMATICS.CTL	
Z	Z	X	X	N/A		
Z	Z	X	X	N/A	TRAJ_STATE.CTL	
Z	Z	X	X	N/A	TRAJECTORY_SPLINE_TYPE_ENUM.CTL	
Ζ	Ζ	Χ	X	N/A	TRAJECTORY.CTL	
Z	Ζ	Χ	Χ	N/A	TRANSFORM2D.CTL	
Z	Ζ	Χ	Χ	N/A	TRANSFORM3D.CTL	
Z	Ζ	Χ	Χ	N/A	TRANSLATION2D.CTL	
Z	Ζ	Χ	Χ	N/A	TRANSLATION3D.CTL	
Z	Z	X	X	N/A	TRAPEZOID PROFILE CONSTRAINT.CTL	
Z		X	X	N/A	TRAPEZOID PROFILE STATE.CTL	
Z	Z	X	X	N/A	TRAPEZOID PROFILE.CTL	
Z	Z	X	\overline{X}	N/A	TWIST2D.CTL	
Z			X	N/A	TWIST3D.CTL	
	<u>Z</u>	X				
Z	Z	X	X	N/A	UNSCENTED_KALMAN_CORRECT_FUNC_GROUP.CTL	
Z	Z	X	X	N/A	UNSCENTED_KALMAN_FILTER.ctl	
Ζ	Z	X	X	N/A	UNSCENTED_KALMAN_NEW_FUNC_GROUP.CTL	
Ζ	Ζ	Χ	Χ	N/A	UTIL_PATHFINDER_CONFIG.CTL	
N/A		N/A		N/A	WAYPOINTS.CTL 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	N/A	X_Y_PAIR.CTL	
					· · · · · · · · · · · · · · · · · · ·	

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