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...

Doc completed Pct 96.15% Optimization Pct 57.45%

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

'===== BASE

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ANALOG DELAY	X Implemented	X Documented	X Not WPILIB	X Menu Item	- Execution Optimized	Test Routine		VI Name AnalogDelay_Execute.vi	Function Prototype	Notes Similar to interpolated tree map	Code Review	Test Program	Error Checking
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
BUMPLESS TRANSFER	X	$X \mid \mathcal{I}$	X	Χ	I			BumplessTransfer_Execute.vi					
	Implemented	Documented	NOT WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
FUNCTION GENERATOR	X	X		Χ	Ī			FunctionGenerator_Add_Value.vi		Similar to interpolated tree map			
	Χ	Χ		Χ	I			FunctionGenerator_Add_XY.vi		Similar to interpolated tree map			
		X		X	1			FunctionGenerator_Calculate.vi		Similar to interpolated tree map			
	X	X	V	X	SI			FunctionGenerator_Clear.vi		Cincilar to internal atod tree			
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FUNCTION GENERATOR MATRIX	Implemented	Documented	X Not WPILIB	X Menu Item	- Execution Optimized	Test Routine	Sample Program	VI Name FunctionGeneratorMatrix Add.vi	Function Prototype	Notes Similar to interpolated tree map	Code Review	Test Program	Error Checking
FUNCTION GENERATOR MATRIX				X	<u> </u>			-unctionGeneratorMatrix_Add.vi FunctionGeneratorMatrix_Calculate.vi		Similar to interpolated tree map Similar to interpolated tree map			
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FRC_LabVIEW_Trajectory_Library_Routines.xlsx

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 X 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 X MedianFilter Calculate.vi 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 VI Name Function Prototype 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	Χ				Timer GetAndReset.vi					
		X .	X	Χ	No				Timer_GetInternal.vi		Internal (private) only			
		X .	X		Χ				Timer_HasPeriodPassed.vi					
		X .		X					Timer_HasPeriodPassedOnce.vi					
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		X	X	-	X				Timer Start.vi					
		X .	X	X	No				Timer_StartInternal.vi					
		X .	X		Χ				Timer_Stop.vi					
		X .	X	X	No				Timer_StopInternal.vi		Internal (private) only			
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		X .	X	Χ	No	I			TimeInterpBoolean_CleanUp.vi		Update to use create matrix			
		X .	X	X	Χ	SI			TimeInterpBoolean_Clear.vi					
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		X .	X	X	Х	I			TimeInterpBoolean_GetSample.vi			\longrightarrow		
		X .	v .	~	Χ	SI			TimeInterpBoolean_GetTimeForValue.vi TimeInterpBoolean_New.vi					
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	X	XX	<i>X</i>	1			TimeInterpRotation2d_GetSample.vi						X
							TimeInterpRotation2d_GetTimeForValue.vi						Х
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	X	X X	(X	SI			TimeInterpRotation2d_PopOldestSample.vi						Х
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TIME INTERPOLATABLE VARIANT	X	$X \mid \lambda$	(X	I			TimeInterpVariant_AddSample.vi		Update to use create matrix				X
	X	X X	(No) 1			TimeInterpVariant_CleanUp.vi		Update to use create matrix				Х
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DEBOUNCER	Χ	X	X		Debouncer_New.vi			
	Χ	Χ	X		Debouncer_Calculate.vi			
	Χ	Χ	XX		Debouncer_Execute.vi			
	Χ	X	No		Debouncer_Reset.vi			
	Χ	Χ	No		Debouncer_HasElapsed.vi			

'======= CONTROLLER

ARM FF	X X X	X X X X	X		X X Menu Item	Execution Optimized	Test Routine		ArmFF_Calculate.vi ArmFF_CalculateVelocityOnly.vi ArmFF_Execute.vi ArmFF_ExecuteVelocityOnly.vi ArmFF_MaxAchieveAccel.vi ArmFF_MaxAchieveVelocity.vi ArmFF_MinAchieveAccel.vi		Notes LabVIEW style single call LabVIEW style single call	Code Review	Test Program	Error Checking
	X	X			X X				ArmFF_MinAchieveVelocity.vi ArmFF_New_ZeroGravity.vi					
	X				X				ArmFF_New.vi					
BANG BANG	X X X X X X X X X X X X X X X X X X X	X X X X X X	X	(X X X X X X X X X X X X X X X X X X X	의 의 의 의 의 의 의 의 의 의 의 의 의 의 의 의 의 의 의	Test Routine		VI Name BangBang_AtSetpoint.vi BangBang_Calculate_PV.vi BangBang_Calculate_SP_PV.vi BangBang_Execute.vi BangBang_GetAll.vi BangBang_GetError.vi BangBang_New.vi BangBang_SetSetpoint.vi BangBang_SetTolerance.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
CONTROLLER UTIL	X mplemented				X Menu Item	Secution Optimized	Test Routine	Sample Program	VI Name ControllerUtil_GetModulusError.vi		Notes This was short lived in WPILIB, but still useful here.	Code Review	Test Program	Error Checking
ELEV FF	X Implemented	X	X		X Menu Item	Execution Optimized	Test Routine		VI Name ElevFF_Calculate.vi ElevFF_CalculateVelocityOnly.vi ElevFF_Execute.vi ElevFF_ExecuteVelocityOnly.vi ElevFF_ExecuteVelocityOnly.vi ElevFF MaxAchieveAccel.vi	Function Prototype	Notes LabVIEW style single call LabVIEW style single call	Code Review	Test Program	Error Checking

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	X	X		X				ElevFF_MinAchieveAccel.vi					
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HOL_DRV_CTRL	. X	\overline{X}	X	X				HolDrvCtrl AdvCalculate Trajectory.vi		Added 1/24/2022		•	
	X	Χ	Χ	Χ				HolDrvCtrl_AdvCalculate.vi		Added 1/24/2022			
	X	Χ		Χ	SI			HolDrvCtrl_AtReference.vi		Added 1/26/21			
	Χ	Χ		Χ	I			HolDrvCtrl_Calculate_Trajectory.vi		Added 1/26/21			
	X	X		X	I			HolDrvCtrl_Calculate.vi		Added 1/26/21			
	X	X	X	X				HolDrvCtrl_Execute_Trajectory.vi		Added 1/24/2022			
	X	X	Χ	X	SI			HolDrvCtrl_Execute.vi HolDrvCtrl New.vi		Future Added 1/26/21			
	X	X	Χ	X	SI			HolDrvCtrl_PackExecuteSP.vi		MUGU 1/20/21			
	X	X	X	X	J.			HolDrvCtrl PackPID.vi		Added 1/24/2022			
	X	X	X	X				HolDrvCtrl PackProfPID.vi		Added 1/24/2022			
	Χ	Χ		Χ	SI			HolDrvCtrl_SetEnabled.vi		Added 1/26/21			
	Χ	Χ		Χ	SI			HolDrvCtrl_SetTolerance.vi		Added 1/26/21			
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PID AUTOTUNE	Χ	X	Χ	No				PIDAutoTune_ClosedLoopStep.vi					
	X	X	X	No				PIDAutoTune_Convert_Academic_To_NonInteracting.vi					
	X	X	X	No X				PIDAutoTune_OpenLoopStep.vi PIDAutoTune_SetTuningArguments.vi					
	X	X	X	X				PIDAutoTune Step Execute.vi					
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	X	X	Χ	Χ				PIDController_AdvCalculate_FF_Sp_Pv.vi		Advanced PID			
	X	X	Χ	X			X	PIDController_AdvExecute.vi		Labview style helper. Advanced			
	~			_	01			PIDController AtSetpoint.vi		PID			
	X	X		X	SI			PIDController_AtSetpoint.vi PIDController Calculate PV.vi					
	X	X		X				PIDController Calculate SP PV.vi		+			
	X	X		X	SI			PIDController_DisableContinousInput.vi					
	X	X		X	SI			PIDController EnableContinousInput.vi					
	Χ	Χ	Χ	Χ			Χ	PIDController_Execute.vi		Labview style helper			
								PIDController_GetContinuousError.vi		OBSOLETE – Removed			
	X	X		X	SI			PIDController_GetPeriod.vi					
	X	X		X	SI			PIDController_GetPID.vi					
	X	X		X	SI			PIDController_GetPositionError.vi					
	X	X		X	SI SI			PIDController_GetSetpoint.vi PIDController GetTolerance.vi					
	X	X		X	SI			PIDController_GetVelocityError.vi					
		X		X	SI			PIDController_IsContinuousInputEnabled.vi					
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	X X X	X		X	1 1			PIDController_New.vi PIDController_NewPeriod.vi					
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		X	Χ	Х	SI	I		PIDController Pack InputLimits.vi					
	X	X	\overline{X}	X	SI			PIDController Pack Tuning.vi					
	X	X		X	SI			PIDController_Reset.vi					
	Χ	X		X	SI			PIDController_SetD.vi					
		Χ		X				PIDController_SetDerivativeFilter.vi		Advanced PID			
	X	Χ	X	No				PIDController_SetFeedForward_OBSOLETE_DELETE.vi		Advanced PID, Obsolete –			
						+	+	DIDO A III O IEEO : ODOOLETE DELETE :		DELETE			
	X	X	X	NO				PIDController_SetFFGain_OBSOLETE_DELETE.vi		Advanced PID, Obsolete – DELETE			
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	, ·	,		,	0,			PIDController_SetInputRange.vi		OBSOLETE - Removed			
	Χ	Χ		Х	SI			PIDController_SetIntegratorRange.vi					
	X	Х	Χ	X	SI			PIDController SetOutputLimits.vi		Advanced PID			
	X	X		X				PIDController_SetP.vi					
	X	Χ	Χ	Χ	SI			PIDController_SetPeriod.vi					
	X	X		X	SI			PIDController_SetPID.vi					
	X	Χ	Χ	X				PIDController_SetPIDF.vi		Advanced PID			
	X	Χ		X				PIDController_SetSetpoint.vi					
	X	Χ		X	SI			PIDController_SetTolerance.vi					
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ID CONTROLLER	X	X		X	SI		0)	ProfiledPIDController AtGoal.vi				.~	<u> </u>
	X	X		X			+	ProfiledPIDController AtSetpoint.vi					
	X	\hat{x}		X	<u>J.</u>			ProfiledPIDController Calculate Meas Goal.vi					
	X	X		X			1	ProfiledPIDController Calculate Meas StateGoal TrapCnsrt.vi					
	X	X		X				ProfiledPIDController Calculate Meas StateGoal.vi					
	X	X		X				ProfiledPIDController Calculate Meas.vi					
	X	X		X	SI			ProfiledPIDController DisableContInput.vi					
	X	X		X	SI			ProfiledPIDController_EnableContInput.vi					
	X	Х	X	Х	I			ProfiledPIDController_Execute.vi		Single call LabVIEW style function.			
	X	X		X				ProfiledPIDController_GetGoal.vi					
	X	X		X	SI			ProfiledPIDController_GetPeriod.vi		W/DILID I			
	X	X	Χ	X				ProfiledPIDController_GetPID.vi		WPILIB has separate getters.			
	X	X		X				ProfiledPIDController_GetPositionError.vi					
	X	X		X	SI			ProfiledPIDController_GetSetpoint.vi					
	X	X		X	SI	+	_	ProfiledPIDController_GetTolerance.vi					
	X	X X		X	SI	+	+	ProfiledPIDController_GetVelocityError.vi ProfiledPIDController New.vi					
		\hat{x}			1	+	+	ProfiledPIDController_NewPeriod.vi					
	X	X		X	SI			ProfiledPIDController Reset PosOnly.vi					
	X	\hat{x}		X	SI		+	ProfiledPIDController_Reset_FosOrity.vi					
U. Caracian de la Car		X		X				ProfiledPIDController Reset.vi					
	X	X		X	SI			ProfiledPIDController SetConstraints.vi					
		X		X	SI			ProfiledPIDController SetGoal PosOnly.vi					
	_ ^ I	X		X				ProfiledPIDController SetGoal.vi					
	X							ProfiledPIDController_SetIntegratorRange.vi					
	X	X		Χ	SI		- 1	ProfiledPIDController_SetPID.vi					
	X X X	X		X	SI								
	X X X	Χ		X X X	SI SI			ProfiledPIDController_SetTolerance_PosOnly.vi ProfiledPIDController SetTolerance PosVel.vi					

3.04 2/11/2023 – Added new pose est2	XX	XX	(Ramsete_Execute_ENG.vi	Use this one!!				
	XX	XX	(SI		Ramsete_Execute_PackTuning_ENG.vi					
	XX	X X	í SI		Ramsete_Execute_PackTuning.vi					
	XX	X X	()		Ramsete_Execute.vi					
	XX	X	(SI		Ramsete_New_B_Z.vi	new(b, zeta)				
	XX		(SI		Ramsete_New.vi	new				
	XX	X	(SI		Ramsete_SetEnabled.vi	SetEnabled				
	XX	X	(SI		Ramsete_SetTolerance.vi	SetTolerance				
	XX		X		Ramsete_SINC.vi	sinc	internal			
	olemented cumented	Not WPILIB Menu Item	ecution Optimize	st Routine mple Program				de Review	st Program	or Checkina
	lw O		ЙI	Test. Samp	VI Name	Function Prototype	Notes	ပိ	7e	En
SIMPLE MOTOR FEEDFOR	WARD X X	XX	(SI		SimpleMotorFF_Calculate_CalcAccel.vi					
	XX		(SimpleMotorFF_Calculate_NextV_Dt.vi					
	XX		(SI		SimpleMotorFF_Calculate.vi	public double calculate(double velocity, double acceleration)				
	XX		(SI		SimpleMotorFF_CalculateVelocityOnly.vi	public double calculate(double velocity)				
		XX			SimpleMotorFF_Ka_AutoTune.vi					
	XX	X			SimpleMotorFF_MaxAchieveAccel.vi	public double maxAchievableAcceleration(double maxVoltage,				
	XX	X	. X		SimpleMotorFF_MaxAchieveVel.vi	double velocity) public double maxAchievableVelocity(double maxVoltage, double acceleration)	•			
	X X	X	. X		SimpleMotorFF_MinAchieveAccel.vi	public double minAchievableAcceleration(double maxVoltage, double velocity)				
	X X	X			SimpleMotorFF_MinAchieveVel.vi	public double minAchievableVelocity(double maxVoltage, double acceleration)				
			(SI		SimpleMotorFF_New.vi	public SimpleMotorFeedforward(double ks, double kv, double ka)				
	XX									
:==== :DV	X X X				SimpleMotorFF_Pack_Ka_Tune_Params.vi	public SimpleMotorFeedforward(double ks, double kv)				
:==== TRY :=====					SimpleMotorFF_Pack_Ka_Tune_Params.vi	public SimpleMotorFeedforward(double ks, double kv)				
TRY :====		X X X X X X X X X X X X X X X X X X X	Execution Optimized	Test Routine Sample Program	VI Name CoordAxis_D.vi CoordAxis_E.vi CoordAxis_N.vi CoordAxis_N.vi CoordAxis_S.vi CoordAxis_S.vi CoordAxis_U.vi CoordAxis_U.vi CoordAxis_W.vi	public SimpleMotorFeedforward(double ks, double kv) Function Prototype	Notes	Code Review	Test Program	Error Checking
TRY :====	E AXIS X X Will be mented X X X X X X X X X X X X X X X X X X X	Not WPILIB X X X X X X X X X X X X X	Signature of the secution of the security of t	X Test Routine Sample Program Sample Program	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 VI Name CoordSystem_Convert_Pose3d.vi CoordSystem_Convert_Rotation3d.vi CoordSystem_Convert_Translation3d.vi CoordSystem_Convert_Translation3d.vi			Code Review Code Review	Test Program	Error Checking
TRY	STEM X X X X X X X X X X X X X X X X X X X	Not WPILIB X X X X X X X X X X X X X	Signature of the state of the s	X X Test Routine Sample Program Sample Program	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 VI Name CoordSystem_Convert_Pose3d.vi CoordSystem_Convert_Rotation3d.vi CoordSystem_Convert_Translation3d.vi CoordSystem_Convert_Transform3d.vi CoordSystem_EDN.vi	Function Prototype	Notes	Review	Test Program	Error Checking
TRY	E AXIS X X Will be mented X X X X X X X X X X X X X X X X X X X	Not WPILIB Not WPILIB X X X X X X X X X X X X X	Signature of the secution of the security of t	X X X Test Routine Sample Program	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 VI Name CoordSystem_Convert_Pose3d.vi CoordSystem_Convert_Rotation3d.vi CoordSystem_Convert_Translation3d.vi CoordSystem_Convert_Translation3d.vi	Function Prototype	Notes	Review	Test Program	Error Checking

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	Implemented	Documented		Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
POSE2D	Χ	X		X	SI			Pose2d_Div.VI					
	Χ	Χ		X	SI			Pose2d_Equals.VI	boolean equals(other obj)				
	Χ	Χ		Χ	X			Pose2d_Exp.vi	pose2d exp(twist2d twist)				
	Χ	X		X	SI			Pose2d_getRotation.vi	rotation2d getRotation()	can also use cluster unpack			
	X	X		X	SI			Pose2d_getTranslation.vi	translation2d getTranslation()	can also use cluster unpack			
	X	X X	Υ _		SI			Pose2d_getXY.vi					
	X	<i>X X</i>	Υ	X .	SI			Pose2d_getXYAngle.vi					
	X	X			I X			Pose2d_Interpolate.vi Pose2d_Log.vi	twist2d log(pose2d end)				
	\hat{X}	X		X	SI			Pose2d Minus.vi	transform2d minus(pose2d other)				
	X	X		X	SI			Pose2d_New_TRRO.vi	pose2d new(translation2d, rotation2d)				
	X	X			SI			Pose2d New.vi	pose2d new(double x, double y, rotation2d)				
	X	X			SI			Pose2d Plus.vi	pose2d plus(transform2d other)				
	Χ	X		X	SI			Pose2d RelativeTo.vi	pose2d relativeto(pose2d other)				
	Χ	Χ		X	SI			Pose2d_Times.vi					
	Χ	Χ		X .	SI			Pose2d_TransformBy.vi	pose2d transformby(transform2d other)				
									pose2d new()	can use cluster constant			
	Implemented	Documented Not Man 15	i wrillb		Execution Optimized	Test Routine	Sample Program				Code Review	st Program	or Checking
	鱼	9	5	₩ I	й	é	Sa	VI Name	Function Prototype	Notes	ပိ	ě	Error
POSE3D	Χ	Χ		$X \mid \cdot$	SI			Pose3d_Div.vi					
	Χ	X			SI			Pose3d_Equals.VI					
	Χ	X		Χ	Χ			Pose3d_Exp.vi					
	X	X		X	SI			Pose3d_getRotation.vi					
	X	X		X	SI			Pose3d_getTranslation.vi					
	X	X	x	X .	SI			Pose3d_getXYZ.vi					
	X	X			<i>I</i>			Pose3d_Interpolate.vi Pose3d_Log.vi			-		
	X	X		X	X SI			Pose3d Minus.vi					
	X	X			SI			Pose3d New.vi					
	X	X		X	SI			Pose3d New Default.vi					
	Х	X			SI			Pose3d New Pose2d.vi					
	Χ	X		X	SI			Pose3d_New_Trans3dRot3d.vi					
	Χ	Χ		X .	SI			Pose3d_Plus.vi					
	X	X		X	SI			Pose3d_RelativeTo.vi					
	X	X		No .	SI			Pose3d_RotationVectorToMatrix.vi					
	X	X			SI SI			Pose3d_ToPose2d.vi					
	X	X		X .	SI			Pose3d_Times.vi Pose3d_TransformBy.vi					
	^	^		^	3,			1 03e3u_Transformby.vi					
	Implemented	Documented	OI WYILIB		Execution Optimized	Test Routine	Sample Program				Code Review	est Program	Error Checking
				Ž		7e	လို	VI Name	Function Prototype	Notes	ٽ_	76	Ē
QUATERNION	X	X	_	X	SI			Quaternion_Equals.vi					
	X	X			SI			Quaternion_Get_All.vi					
	X	X		X X	SI SI			Quaternion_Get_LVQuat.vi Quaternion_Get_Vect.vi					
	X	X		X	SI			Quaternion_Get_Vect.vi Quaternion_Get_W.vi			+		
	X	X		X	SI			Quaternion Inverse.vi					
	X	X		X	SI			Quaternion New.vi					
	X	X			SI			Quaternion_New_Default.vi					
	X	X		X	SI			Quaternion_New_LVQuat.vi					
	Χ	X		X .	SI			Quaternion_Normalize.vi					

X		X	X	SI		Quaternion_Plus.vi
X	- '	X	Χ	SI		Quaternion_Times.vi
X		X	Χ	SI		Quaternion ToRotationVector.vi

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

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

mation Lis	,,										
,											
	X	X		X	SI		Transform2d_Create_TransRot.vi	transform2d new(translation2d, rotation2d)			
	X	X		Χ	SI		Transform2d Div.vi				
	X	X		X	SI		Transform2d Equals.VI	boolean equals(other transform2d)			
-											
	X	X		X	SI		Transform2d_GetRotation.VI	rotation2d getRotation() use cluster unpack			
	X	X		Χ	SI		Transform2d_GetTranslation.VI	translation2d getTranslation() use cluster unpack			
	X	X	X	X	SI		Transform2d_GetXY.vi				
	X	X	Χ	X	SI		Transform2d_GetXYAngle.vi				
	Х	X		X	SI		Transform2d Inverse.vi	transform inverse() new			
								transform inverse()			
	X	X		X	Si		Transform2d_Plus.vi				
	X	X		Χ	SI		Transform2d_Times.vi	transform2d times(double scalar)			
								transform2d new() can use cluster constant			
SFORM3D	X X X Implemented	X X Documented	Not WPILIB	X Wenu Item	ର ଓ ଓ Execution Optimi	Test Routine	VI Name Transform3d_Create_Default.vi Transform3d_Create_Pose3dPose.3dv Transform3d_Create_Trans3dRot3d.vi Transform3d_Div.vi		Code Review	Test Program	Error Checking
ŀ			-								_
	X	Χ		Χ	SI		Transform3d_Equals.VI				-
	Χ	X		Χ	SI		Transform3d_GetRotation3d.VI				
	X	X		X	SI		Transform3d GetTranslation3d.VI				
	X		Χ	X	SI		Transform3d GetXYZ.vi				
	X	X		\hat{X}	SI		Transform3d Inverse.vi				
			+			+					
	X	X		X	Si		Transform3d_Plus.vi				
	Χ	X		Χ	SI		Transform3d_Times.vi				
	ented	ənted	יור וB	em.	on Optimized	utine	Program		eview	ogram	hecking
	nplemented	ocumented	lot WPILIB	lenu Item		est Routine	ample Program	Function Drototyne	ode Review	est Program	iror Checking
A TIONAD D	Implemented	Documented	Not WPILIB	Menu Item	Execution	Test Routine	ପୁର VI Name	Function Prototype Notes	Code Review	Test Program	Error Checking
ATION2D	X	Χ	Not WPILIB	Χ	S Execution	Test Routine	vi Name Translation2d_Create_DistAng.vi		Code Review	Test Program	Error Checking
ATION2D	X	X X	Not WPILIB	X X	S Execution	Test Routine	VI Name Translation2d_Create_DistAng.vi Translation2d_Create.vi	Function Prototype Notes translation2d new(double x, double y)	Code Review	Test Program	Error Checking
ATION2D	X	X X X	Not WPILIB	X X X	IS Execution	Test Routine	VI Name Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi	translation2d new(double x, double y)	Code Review	Test Program	Error Checking
ATION2D	X X X	X X X	Not WPILIB	X X X	IS Execution	Test Routine	VI Name Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi	translation2d new(double x, double y)	Code Review	Test Program	Error Checking
ATION2D	X X X	X X X X	Not WPILIB	X X X X	IS IS Execution	Test Routine	VI Name Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi Translation2d_Equals.vi		Code Review	Test Program	Emor Checking
ATION2D	X X X X X	X X X X	Not WPILIB	X X X X	IS IS Execution	Test Routine	VI Name Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi Translation2d_Equals.vi Translation2d_Equals.vi Translation2d GetAngle.vi	translation2d new(double x, double y) boolean equals(translation other)	Code Review	Test Program	Emor Checking
ATION2D	X X X X X	X X X X X	Not WPILIB	X X X X X	IS IS Execution	Test Routine	VI Name Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi Translation2d_Equals.vi Translation2d_GetAngle.vi Translation2d_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 X	Not WPILIB	X X X X X X	IS IS Execution	Test Routine	VI Name Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Div.vi Translation2d_Equals.vi Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_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 X X X X	IS IS Execution	Test Routine	VI Name Translation2d Create_DistAng.vi Translation2d Create.vi Translation2d Div.vi Translation2d Equals.vi Translation2d GetAngle.vi Translation2d GetDistance.vi Translation2d GetNorm.VI Translation2d GetX.VI	translation2d 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 X X X X	Not WPILIB	X X X X X X X X	IS I	Test Routine	VI Name Translation2d Create_DistAng.vi Translation2d Create.vi Translation2d Div.vi Translation2d Equals.vi Translation2d GetAngle.vi Translation2d GetDistance.vi Translation2d GetNorm.VI Translation2d GetX.VI Translation2d GetXY.VI	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() can use cluster unpack double getX() 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 X X X X	IS I	Test Routine	VI Name Translation2d Create_DistAng.vi Translation2d Create.vi Translation2d Div.vi Translation2d Equals.vi Translation2d GetAngle.vi Translation2d GetDistance.vi Translation2d GetNorm.VI Translation2d GetX.VI	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() can use cluster unpack	Code Review	Test Program	Emor Checking
ATION2D	X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Not	X X X X X X X X X		Test Routine	VI Name Translation2d Create_DistAng.vi Translation2d Create.vi Translation2d Div.vi Translation2d Equals.vi Translation2d GetAngle.vi Translation2d GetDistance.vi Translation2d GetNorm.VI Translation2d GetX.VI Translation2d GetXY.VI Translation2d GetY.VI Translation2d GetY.VI	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() can use cluster unpack double getX() 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 X X X X X X X X X X X X X X X	Not	X X X X X X X X X X		Test Routine	VI Name Translation2d Create_DistAng.vi Translation2d Create.vi Translation2d Div.vi Translation2d Equals.vi Translation2d GetAngle.vi Translation2d GetDistance.vi Translation2d GetNorm.VI Translation2d GetX.VI Translation2d GetXY.VI Translation2d GetY.VI Translation2d GetY.VI Translation2d Interpolate.vi	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() can use cluster unpack double getX() double getY() 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 X X X X X X X X X X X X X X X X X X	Not	X X X X X X X X X X X X X X X X X X X		Test Routine	VI Name Translation2d Create_DistAng.vi Translation2d Create.vi Translation2d Div.vi Translation2d Equals.vi Translation2d GetAngle.vi Translation2d GetNorm.VI Translation2d GetXy.VI Translation2d GetXy.VI Translation2d GetY.VI Translation2d GetY.VI Translation2d Interpolate.vi Translation2d Minus.vi	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() can use cluster unpack can use cluster unpack double getY() 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 X X X X X	X X X X X X X X X X X X X X X X X X X	Not	X X X X X X X X X X X X X X X X X X X		Test Routine	VI Name Translation2d Create_DistAng.vi Translation2d Div.vi Translation2d Equals.vi Translation2d GetAngle.vi Translation2d GetNorm.VI Translation2d GetNorm.VI Translation2d GetXY.VI Translation2d GetXY.VI Translation2d GetY.VI Translation2d GetY.VI Translation2d Interpolate.vi Translation2d Minus.vi Translation2d Plus.vi	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() can use cluster unpack double getY() can use cluster unpack translation2d minus(translation2d other) translation2d plus(translation2d other)	Code Review	Test Program	Error Checking
ATION2D	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Not	X X X X X X X X X X X X X X X X X X X	10 10 10 10 10 10 10 10	Test Routine	VI Name Translation2d Create DistAng.vi Translation2d Div.vi Translation2d Equals.vi Translation2d GetAngle.vi Translation2d GetNorm.VI Translation2d GetNorm.VI Translation2d GetX.VI Translation2d GetX.VI Translation2d GetY.VI Translation2d GetY.VI Translation2d Interpolate.vi Translation2d Minus.vi Translation2d Plus.vi Translation2d Plus.vi Translation2d RotateBy.vi	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() can use cluster unpack double getY() can use cluster unpack translation2d minus(translation2d other) translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other)	Code Review	Test Program	Emor Checking
ATION2D	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Not	X X X X X X X X X X X X X X X X X X X	S	Test Routine	VI Name Translation2d Create DistAng.vi Translation2d Div.vi Translation2d Equals.vi Translation2d GetAngle.vi Translation2d GetNorm.VI Translation2d GetNorm.VI Translation2d GetX.VI Translation2d GetX.VI Translation2d GetY.VI Translation2d GetY.VI Translation2d Interpolate.vi Translation2d Minus.vi Translation2d Plus.vi Translation2d Plus.vi Translation2d RotateBy.vi Translation2d Times.vi	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() can use cluster unpack double getY() can use cluster unpack translation2d minus(translation2d other) translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar)	Code Review	Test Program	Emor Checking
ATION2D	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Not	X X X X X X X X X X X X X X X X X X X	10 10 10 10 10 10 10 10	Test Routine	VI Name Translation2d Create DistAng.vi Translation2d Div.vi Translation2d Equals.vi Translation2d GetAngle.vi Translation2d GetNorm.VI Translation2d GetNorm.VI Translation2d GetX.VI Translation2d GetX.VI Translation2d GetY.VI Translation2d GetY.VI Translation2d Interpolate.vi Translation2d Minus.vi Translation2d Plus.vi Translation2d Plus.vi Translation2d RotateBy.vi	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() can use cluster unpack double getY() can use cluster unpack translation2d minus(translation2d other) translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar) translation2d unaryminus()	Code Review	Test Program	Error Checking
ATION2D	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Not	X X X X X X X X X X X X X X X X X X X	S	Test Routine	VI Name Translation2d Create DistAng.vi Translation2d Div.vi Translation2d Equals.vi Translation2d GetAngle.vi Translation2d GetNorm.VI Translation2d GetNorm.VI Translation2d GetX.VI Translation2d GetX.VI Translation2d GetY.VI Translation2d GetY.VI Translation2d Interpolate.vi Translation2d Minus.vi Translation2d Plus.vi Translation2d Plus.vi Translation2d RotateBy.vi Translation2d Times.vi	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() can use cluster unpack double getY() can use cluster unpack translation2d minus(translation2d other) translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar) translation2d unaryminus() translation2d new() 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 X X X X X	X X X X X X X X X X X X X X X X X X X	Not	X X X X X X X X X X X X X X X X X X X	S	Test Routine	VI Name Translation2d Create DistAng.vi Translation2d Div.vi Translation2d Equals.vi Translation2d GetAngle.vi Translation2d GetNorm.VI Translation2d GetNorm.VI Translation2d GetX.VI Translation2d GetX.VI Translation2d GetY.VI Translation2d GetY.VI Translation2d Interpolate.vi Translation2d Minus.vi Translation2d Plus.vi Translation2d Plus.vi Translation2d RotateBy.vi Translation2d Times.vi	translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() can use cluster unpack double getY() can use cluster unpack translation2d minus(translation2d other) translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar) translation2d unaryminus() translation2d new() can use cluster unpack	Code Review	Test Program	Error Checking
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Revision 3.04 2/11/2023 – Added new pose est2												
		X		Χ	SI		Translation3d_GetDistance.vi					
	X	X	\ <u></u>	X	SI		Translation3d_GetNorm.VI					:
	X	X	X	X	SI		Translation3d_GetXYZ.vi Translation3d_Interpolate.vi					
	X			X	SI		Translation3d Minus.vi					
	X	X		X	SI		Translation3d Plus.vi					
	X				SI		Translation3d_RotateBy.vi					
	X	X		X	SI		Translation3d Times.vi					
	X			Χ	SI		Translation3d_ToTranslation2d.vi					
	X	X		Χ	SI		Translation3d_UnaryMinus.vi					
TWIST2	X X X X X X X X X X	X	Not WPILIB X Not WPILIB	X X Menu Item	Execution Optimized	X Test Routine Sample Program Sample Program	VI Name Twist2d_Create.vi Twist2d_Equals.VI Twist2d_GetAll.VI VI Name Twist3d_Create.vi	Function Prototype twist new(x, y, theta) boolean equals(obj other) Function Prototype	Notes	Code Review Code Review	Test Program	Error Checking
TWIST3					SI	X						
	X	X	X	X	SI	X	Twist3d_Equals.VI Twist3d_GetAll.VI					
		Ι Λ	Λ	<i>X</i>	31	Χ	TWISCO_GETAIL.VI					
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	olemented	cumented	t WPILIB	1enu Item	ecution Optimized	Test Routine Sample Program				de Review	st Program	or Checking
	Imp	Do	Not	~	Exe	Test	VI Name	Function Prototype	Notes	Š	7e.	Eur
CHASSIS SPEED				Χ	SI		ChassisSpeeds_FromFieldRelativeChassisSpeeds.VI					
	X	X		X	SI		ChassisSpeeds_FromFieldRelativeSpeeds.VI	chassisspeeds fromFieldRelativeSpeeds(double x, double y,				
	Y	X	Y	X	SI		ChassisSPeeds_GetXYOmega.vi	double angvel, rotation2d robotangle)	+			
	X	\hat{x}	^	\hat{x}	SI		ChassisSpeeds_New.vi	chassisspeeds new (double xvel, double yvel, double angvel)				
							<u> </u>	chassisspeeds new ()	can use cluster constant			
	plemented	ocumented	ot WPILIB	enu Item	ecution Optimized	st Routine ample Program				ode Review	st Program	ror Checking
	lu l	_ <u>```</u>	≥ .	×	Ĭ,	Test	VI Name	Function Prototype	Notes	Cod		Ē
DIFFERENTIAL DRIVE KINEMATICS				X		X	DiffKinematics_New.vi	diffDriveKine new(double trackWidth)				:
	X	X		X	X	X	DiffKinematics_toChassisSpeed.vi	chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds)				
	X	X		X	SI	Y	DiffKinematics_ToTwist2d.vi DiffKinematics_toWheelSpeed.vi	diffDriveWheelSpeed toWheelSpeeds(chassisSpeeds)				
	Λ	_ X		^	SI	^	Difficilientatics_townieerspeed.vi	difficultive write-induced control c				
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking

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 X Replacement for orig diff drive XX DiffDrvOdom2 GetPose.vi X X X X DiffDrvOdom2_New.vi X 1 X SI DiffDrvOdom2_Reset.vi DiffDrvOdom2 Update.vi Χ 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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MECANUM DRIVE ODOMETRY

X	()	Υ	X									
		/		_			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>'</u>	X		+		MecaWheelPos_New.vi MecaWheelPos_Sub.vi					
	<u> </u>	`		- 0,			INICCAVVIICCII 03_0ub.vi					
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 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
n	5 6	ડ ક	¥	Ě		San	VI Name	Function Prototype	Notes	ပိ	Test	En
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)				

023 – Added new pose est2													
	X	Χ	Χ	X				SwerveOdometry_Update4.VI		For 4 module drives			
								SwerveOdometry_UpdateWithTime4.VI		REMOVED			
							(SwerveOdometry_UpdateWithTimeX.VI		REMOVED			
	X	Χ	X	X			Ç	SwerveOdometry_UpdateX.VI		uses array as input			
									public Pose2d updateWithTime(double currentTimeSeconds,	variable parameters (replace with			
									Rotation2d gyroAngle, SwerveModuleState moduleStates)	array and "4" calls)			
									public Pose2d update(Rotation2d gyroAngle, SwerveModuleState moduleStates)	variable parameters (replace with array and "4" calls)			
	ted	pe _q	B	,	Optimized	ine	rogram				iew	ram	cking
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	em	<u> </u>	¥	u li	nt	ĕ	Sample				E E	ď	Ő
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			Ž			<u> </u>		/I Name	Function Prototype	Notes	ပိ	ĭ	ш́.
VERVE DRIVE MODULE POSITIONS				Χ	SI			SwerveModulePosition_CompareTo.vi					
	X				SI			SwerveModulePosition_Equals.vi					
	X			X	SI			SwerveModulePosition_Get.vi					
	X	X		Χ	SI			SwerveModulePosition_New.vi					
	\Box												
	mplemented	Documented	Vot WPILIB	Menu Item	Execution Optimize	Test Routine	Sample Program				de Review	st Program	or Checking
	m,	ŏ	δ	Me	ŭ	<u>Te</u> s	Sa,	/I Name	Function Prototype	Notes	Cod	7e	Į.
SWERVE DRIVE MODULE STATE	\overline{X}	X	\neg		SI	·		SwerveModuleState CompareTo.vi	public int compareTo(SwerveModuleState o)			•	
	X			X	SI			SwerveModuleState Equal.vi					
	X		$\overline{}$	X				SwerveModuleState Get.vi					
	X		\longrightarrow		SI			SwerveModuleState_New.vi	public SwerveModuleState(double speedMetersPerSecond,				
	^	^	ļ	_ ^	<i>O</i> ,		ľ	ower vermodule etate_ive w.vi	Rotation2d angle)				
	X	X		X	SI			SwerveModuleState_Optimize.vi	public SwerveModuleState optimize(SwerveModuleState desired,				
									Rotation2d angle)				
	Implemented	Documented	Not WPILIB	Menu Item	ecution Optimized	st Routine	mple Program	/I Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
			<	2	Ехес	Test	Sa	/i Name			0		
CUBIC HERMITE SPLINE			_		Ě			·	protected SimpleMatrix getCoefficients()	not needed, use cluster unpack	<u> </u>		
CUBIC HERMITE SPLINE				X	Ë	7es		CubicHermiteSpline_getControlVectorFromArrays.vi	protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[]		<u> </u>		
CUBIC HERMITE SPLINE		X			Ë	7es	(·	protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis()				
CUBIC HERMITE SPLINE	X	X		X	Ĕ		(CubicHermiteSpline_getControlVectorFromArrays.vi	protected SimpleMatrix getCoefficients() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector)				
CUBIC HERMITE SPLINE	Implemented X X X	X	Not WPILIB	X	9 Execution Optimized Ex	coutine	Sample Program	CubicHermiteSpline_getControlVectorFromArrays.vi	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		Code Review	Test Program	Error Checking
	Implemented X X X	X X X X	мыгів	Menu Item X	Execution Optimized	coutine	Sample Program	CubicHermiteSpline_getControlVectorFromArrays.vi CubicHermiteSpline_makeHermiteBasis.vi CubicHermiteSpline_New.vi	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)	not needed, use cluster unpack Notes	de Review	Test Program	Error Checking
	Implemented X X X	X X X X	мыгів	Menu Item X	Execution Optimized	coutine	Sample Program	CubicHermiteSpline_getControlVectorFromArrays.vi CubicHermiteSpline_makeHermiteBasis.vi CubicHermiteSpline_New.vi	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 Can use cluster constant	de Review	Test Program	Error Checking
	Implemented X X X	X X X X	мыгів	Menu Item X	Execution Optimized	coutine	Sample Program	CubicHermiteSpline_getControlVectorFromArrays.vi CubicHermiteSpline_makeHermiteBasis.vi CubicHermiteSpline_New.vi	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	not needed, use cluster unpack Notes	de Review	Test Program	Error Checking

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

Added new pose est2					~								
					izec		_						
QUINTIC HERMITE SPLINE	× Implemented	X Documented	Not WPILIB	X Menu Item	Execu		Sample Program	VI Name QuinticHermiteSpline_getControlVectorFromArrays.vi	Function Prototype private SimpleMatrix getControlVectorFromArrays(double[]	Notes	Code Review	Test Program	Error Checking
QUINTIC HERMITE SPLINE	<i>x</i>	^		^				QuintichermiteSpline_getControlvectorFromArrays.vi	initialVector, double[] finalVector)				
	X	X		X				QuinticHermiteSpline_makeHermiteBasis.vi	private SimpleMatrix makeHermiteBasis()				
	X	X		X				QuinticHermiteSpline_New.vi	public QuinticHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector) protected SimpleMatrix getCoefficients()	not needed, use cluster unpack			
									protected offipiewath's getocemeterist)	not needed, use cluster unpack			
SPLINE (Abstract class)	X Implemented	X Documented	Not WPILIB	X Menu Item	Exect	Total Control	Sample Program	VI Name Spline_getPoint.vi	Function Prototype public PoseWithCurvature getPoint(double t) Spline(int degree)	Notes	Code Review	Test Program	Error Checking
									Spline(int degree) public static class ControlVector				
									•	implemented as data structure			
	Implemented	Documented	WPILIB	ıu Item	Execution Optimized	- Giting 0	rest Koutine Sample Program				e Review	t Program	ır Checking
	du	000	Not	Menu	Exe	, ,	Sami	VI Name	Function Prototype	Notes	80	Test	Erro
SPLINE HELPER		X		X	SI		K	SplineHelp_GetCubicCtrlVector.vi	private static Spline.ControlVector getCubicControlVector(double scalar, Pose2d point) public static Spline.ControlVector[]			·	
	X						`	SplineHelp_GetCubicCtrlVectorsFromWayPts.vi	getCubicControlVectorsFromWaypoints(Pose2d start, Translation2d[] interiorWaypoints, Pose2d end)				
		X	X	X		_		SplineHelp_GetCubicCtrlVectorsFromWeightedWayPts.vi		:			
	X		X					SplineHelp_GetCubicSpline_Calc1.vi SplineHelp_GetCubicSpline_Calc2.vi		internal			
	X	X	$\frac{1}{X}$	No	,			SplineHelp GetCubicSpline Calc3.vi		internal			
	X	X		X)	Υ	SplineHelp_getCubicSplinesFromControlVectors.vi	public static CubicHermiteSpline[] getCubicSplinesFromControlVectors(Spline.ControlVector start, Translation2dfl waypoints, Spline ControlVector end)				
	X	X		X	SI	'		SplineHelp_GetQuinticCtrlVector.vi	Translation2d[] waypoints, Spline.ControlVector end) private static Spline.ControlVector getQuinticControlVector(double				
								SplineHelp_GetQuinticCtrlVectorsFromWayPts.vi	scalar, Pose2d point) public static List <spline.controlvector> getQuinticControlVectorsFromWaypoints(List<pose2d> waypoints)</pose2d></spline.controlvector>	REMOVED 2762			
	X	X		X				SplineHelp_GetQuinticCtrlVectorsFromWeightedWayPts.vi SplineHelp_getQuinticSplinesFromControlVectors.vi	public static QuinticHermiteSpline[] getQuinticSplinesFromControlVectors(Spline.ControlVector[] controlVectors)	REMOVED 2762			
			X					SplineHelp_GetQuinticSplinesFromWeightedWayPts.vi		New 2762			
	X	X		No				SplineHelp_GetQuinticSplinesFromWayPts.vi SplineHelp_ThomasAlgorithm.vi	private static void thomasAlgorithm(double[] a, double[] b, double[] c, double[] d, double[] solutionVector)	New 2762 internal			
SPLINE PARAMETERIZER	X Implemented	X Documented	Not WPILIB	X Menu Item	Execu	Total to T	Sample Program	VI Name SplineParam_Spline_T0_T1.vi	Function Prototype public static List <posewithcurvature> parameterize(Spline spline,</posewithcurvature>	Notes	Code Review	Test Program	Error Checking
	X	X	-	X		-	X	SplineParam_Spline.vi	double t0, double t1) public static List <posewithcurvature> parameterize(Spline spline)</posewithcurvature>				
	Χ	X	X	No)			SplineParam_StackGet.vi		internal			

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

Χ

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X X X X

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 $X \mid X \mid$

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X	X		X			TrajectoryConfig IsReversed.vi	public boolean isReversed()	can use cluster unpack	
Χ	Χ	Х	Χ	SI		TrajectoryConfig setCentripetalAccel.vi	, v	·	
Χ	X		Х			TrajectoryConfig_SetEndVelocity.vi	public TrajectoryConfig setEndVelocity(double endVelocityMetersPerSecond)		
X	X		X	SI		TrajectoryConfig_setKinematicsDiffDrive.vi	public TrajectoryConfig setKinematics(DifferentialDriveKinematics kinematics)		
Χ	Х		Х	SI		TrajectoryConfig_setKinematicsMecanumfDrive.vi	public TrajectoryConfig setKinematics(MecanumDriveKinematics kinematics)		
X	X		X	SI		TrajectoryConfig_setKinematicsSwerveDrive.vi	public TrajectoryConfig setKinematics(SwerveDriveKinematics kinematics)		
Χ	Χ		X	SI		TrajectoryConfig setReversed.vi	public TrajectoryConfig setReversed(boolean reversed)		
X	Х		X			TrajectoryConfig_SetStartVelocity.vi	public TrajectoryConfig setStartVelocity(double startVelocityMetersPerSecond)		
X	Χ	X	Χ	SI		TrajectoryConfig_setVoltageDiffDrive.vi	, i		
							public double getMaxVelocity()	Created function to return both	
							public double getMaxAcceleration()	Created function to return both	
		•			•		NOTE ADD OTHER "SET" ROUTINES FOR OTHER CONTRAINTS HERE, SINCE NEW CONTRAINTS ARE SPECIFIC AND NOT GENERIC.		

	Implemented	Documented	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.ControlVecto 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	Χ	Χ	Χ				TrajectoryGenerate_Make_Generic.vi	Helper to bring these all together	Use this one!!!			
	X	Х		X				TrajectoryGenerate_Make_Quintic_CtrlVect.vi	public static Trajectory generateTrajectory(ControlVectorList controlVectors, TrajectoryConfig config)	uses quintic splines			
	Χ	Χ	X	X				TrajectoryGenerate_Make_Quintic_Weighted.vi	, , , , , , , , , , , , , , , , , , , ,	New 2762			
	X	X		X				TrajectoryGenerate_Make_Quintic.vi	public static Trajectory generateTrajectory(List <pose2d> waypoints, TrajectoryConfig config)</pose2d>	uses quintic splines			
	X	X		X				TrajectoryGenerate_splinePointsFromSplines.vi	public static List <posewithcurvature> splinePointsFromSplines(Spline[] splines)</posewithcurvature>				
					pəz								

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimiz	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<br Spline.ControlVector> collection)	may not need, just data			

	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 XX 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) Routine 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 XX 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

TRIPETAL ACCELERATION CONSTRAINT	-		-	1/			10		
	X	X		X			CentripetalAccelConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X			CentripetalAccelConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X	SI		CentripetalAccelConstraint_New.vi	public CentripetalAccelerationConstraint(double maxCentripetalAccelerationMetersPerSecondSq)	Can use cluster pack for now
					pe	•		\	
	nplemented	Documented	Vot WPILIB	Menu Item	Execution Optimized	Sample Program			
DIFF DRIVE KINEMATIC CONSTRAINT		Ŋ X	_ <u>~</u>	<u> </u>	<u> </u>	Sa '	VI Name DiffDriveKinematicsConstraint_getMaxVelocity.vi	Function Prototype public double getMaxVelocityMetersPerSecond(Pose2d	Notes
DIT DRIVE RINEWATIC CONSTRAINT								poseMeters, double curvatureRadPerMeter, double velocitvMetersPerSecond)	
	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)	
	plemente	Documented	Vot WPILIB	Menu Item	Execution Optimized	st Nouthre mple Program			
			8		Й,	Sam	VI Name	Function Prototype	Notes
DIFF DRIVE VOLTAGE CONSTRAINT		X		X			DiffDriveVoltageConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X			DiffDriveVoltageConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X	SI		DiffDriveVoltageConstraint_New.vi	public DifferentialDriveVoltageConstraint(SimpleMotorFeedforward	
	1	t i						feedforward, DifferentialDriveKinematics kinematics, double	
				\perp	<i>p</i> ₆			feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	
	mented	mented	PILIB	Item	Optimized	Journal He Program		feedforward, DifferentialDriveKinematics kinematics, double	
	nplemented	ocumented	ot WPILIB	lenu Item	ution Optimized	ample Program	Millione	feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	Nucce
ELLIPTICAL REGION CONSTRAINT	mplemented	X Documented	Not WPILIB	Menu	ution Optimized	Sample Program	VI Name EllipRegionConstraint_getMaxVelocity.vi	feedforward, DifferentialDriveKinematics kinematics, double	Notes
ELLIPTICAL REGION CONSTRAINT	X	X		X Wenu	ution Optimized	Sample Program	EllipRegionConstraint_getMaxVelocity.vi EllipRegionConstraint_getMinMaxAccel.vi	feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	Notes
ELLIPTICAL REGION CONSTRAINT	X X X	X X X		X X X	ution Optimized	Sample Program	EllipRegionConstraint_getMaxVelocity.vi EllipRegionConstraint_getMinMaxAccel.vi EllipRegionConstraint_IsPoseInRegion.vi	feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	Notes
ELLIPTICAL REGION CONSTRAINT	X X X	X		X Wenu	ution Optimized	Sample Program	EllipRegionConstraint_getMaxVelocity.vi EllipRegionConstraint_getMinMaxAccel.vi	feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	Notes
ELLIPTICAL REGION CONSTRAINT	x X X X	X X X	WPILIB	X X X	ecution Optimized Execution Optimized	ample Program Sam	EllipRegionConstraint_getMaxVelocity.vi EllipRegionConstraint_getMinMaxAccel.vi EllipRegionConstraint_IsPoseInRegion.vi EllipRegionConstraint_New.vi	feedforward, DifferentialDriveKinematics kinematics, double maxVoltage) Function Prototype	
	X	X X X X Documented	Not WPILIB	Item X X X X	ution Optimized Execution Optimized	ram	EllipRegionConstraint_getMaxVelocity.vi EllipRegionConstraint_getMinMaxAccel.vi EllipRegionConstraint_IsPoseInRegion.vi EllipRegionConstraint_New.vi	feedforward, DifferentialDriveKinematics kinematics, double maxVoltage) Function Prototype Function Prototype	Notes
ELLIPTICAL REGION CONSTRAINT	X	X X X X Documented	WPILIB	Item X X X X	ecution Optimized Execution Optimized	ample Program Sam	EllipRegionConstraint_getMaxVelocity.vi EllipRegionConstraint_getMinMaxAccel.vi EllipRegionConstraint_IsPoseInRegion.vi EllipRegionConstraint_New.vi	feedforward, DifferentialDriveKinematics kinematics, double maxVoltage) Function Prototype Function Prototype	

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					nize	,			
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optim	resi Rouillie Sampla Brogran			
	Imple	Оос	Not 1	Men	EX GC	יבא <i>ו</i>	VI Name	Function Prototype	Notes
MAX VELOCITY CONSTRAINT	Χ	Χ		X	SI		MaxVelocityConstraint_getMaxVelocity.vi	71	
	X	X			SI SI		MaxVelocityConstraint_getMinMaxAccel.vi MaxVelocityConstraint_New.vi		
					pə				
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimiz	rest Routifie Sample Drogram			
	эJdш	Joc	Vot 1	∕len:	ixec	is a	VI Name	Function Prototype	Notes
MECANUM DRIVE KINEMATICS CONSTRAINT	Χ	Χ		X			MecaDriveKinematicsConstraint getMaxVelocity.vi		
	X	X		X	SI	+	MecaDriveKinematicsConstraint_getMinMaxAccel.vi MecaDriveKinematicsConstraint_New.vi		
	Implemented	Documented	WPILIB	Item	tion Optimized	rest Kodine Sampla Program			
	plen	cun	ot W	Menn	Execution	rest Rot			
RECTANGULAR REGION CONSTRAINT	<u>E</u>	X	Not	X	Щ I	2 2	VI Name RectRegionConstraint_getRectRegion.vi	Function Prototype	Notes
RESTANGUEAR REGION CONCINAINT	Χ	Χ		X			RectRegionConstraint getMinMaxAccel.vi		
	X	X		X X			RectRegionConstraint_lsPoseInRegion.vi RectRegionConstraint_New.vi		
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Semple Program	VI Name	Function Prototype	Notes
SWERVE DRIVE KINEMATICS CONSTRAINT	X	X		X			SwerveDriveKinematicsConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double	
	X	Х		X			SwerveDriveKinematicsConstraint_getMinMaxAccel.vi	velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	Х		X	SI		SwerveDriveKinematicsConstraint_New.vi	Newpublic SwerveDriveKinematicsConstraint(final SwerveDriveKinematics kinematics, double maxSpeedMetersPerSecond)	Can use cluster pack for now
	Implemented	Documented	t WPILIB	Menu Item	Execution Optimized	rest Routine Semple Program			
TRAJECTORY CONSTRAINT	<u>E</u>		X	X	й і	2 C	VI Name TrajConstraint_GetMaxVelocity.vi	Function Prototype	Notes
TRAJECTORT CONSTRAINT	Χ	Χ	X	X			TrajConstraint_GetMinMaxAccel.vi		
The state of the s			Χ				TrajConstraint_GetType.vi		

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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	Nample Program	Function Prototype Notes
UTIL		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	
	Χ	X	X	X			Util_GetTime.vi	Once tested completely, this should be optimized!
	Χ	Χ	Χ	No	1		Util_GetTime_U32.vi	
	Χ	Χ	Χ	No	I		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_Sl.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

'========

CONVERSIONS

'========

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

JAVA / C++ WPILIB EQUIVALENT

	mplemented	Oocumented	Vot WPILIB	Menu Item	Execution Optimized	Fest Routine	Sample Program	VI Name	Function Prototype	Notes
CONV	\overline{x}	\overline{X}	X	X	SI			Conv_AngleDegrees_Heading.vi		
	Χ	Χ	Χ	Χ	SI			Conv_AngleRadians_Heading.vi		
	Χ	X	Χ	Χ	SI			Conv_Centimeters_Meters.vi		
	Χ	X	Χ	Χ	SI			Conv_Deg_Radians.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Deg_Rotations.vi		
	Χ	X	Χ	Χ	SI			Conv_Feet_Meters.vi		

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X	Χ	X	Χ	SI	Conv_GyroDegrees_Heading.vi
X	Χ	Χ	Χ	SI	Conv_Heading_AngleRadians.vi
X	Χ	X	Χ	SI	Conv_Inches_Meters.vi
X	Χ	X	Χ	SI	Conv_Kilograms_Pounds.vi
X	Χ	Χ	Χ	SI	Conv_Meters_Feet.vi
X	Χ	X	Χ	SI	Conv_Meters_Inches.vi
X	Χ	X	Χ	SI	Conv_Pose2d_SI_Eng.vi
X	Χ	X	Χ	SI	Conv_Pounds_Kilograms.vi
X	Χ	X	Χ	SI	Conv_Radians_Deg.vi
X	Χ	Χ	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	VI 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		X	SI			Units_InchesToMeters.vi		
	Χ	Χ		Χ	SI			Units_MetersToFeet.vi		
	Χ	Χ		Χ	SI			Units_MetersToInches.vi		
	Χ	Χ		X	SI			Units_MillisecondsToSeconds.vi		
	Χ	Χ		X	SI			Units_RadiansPerSecondToRotationsPerMinute.vi		
	Χ	Χ		Χ	SI			Units_RadiansToDegrees.vi		
	Χ	Χ		Χ	SI			Units_RadiansToRotations.vi		
	Χ	X		Χ	SI			Units_RotationsPerMinuteToRadiansPerSecond.vi		
	Χ	Χ		X	SI			Units_RotationsToDegrees.vi		
	Χ	X		X	SI			Units_RotationsToRadians.vi		
	X	X		X	SI			Units SecondsToMilliseconds.vi		

'====== PATHFINDER UTIL

'=====

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimizea	Test Routine	Sample Program	VI Name	Function Prototype
PATHFINDERUTIL	Χ	X	X	Χ				PathfinderUtil_Continuous_Heading_Difference.vi	
	Χ	X	X	Χ				PathfinderUtil_OptimizeTrajectoryStates.vi	
	Χ	Χ	X	Χ				PathfinderUtil_ToTrajectory.vi	
	X	X	X	X				PathfinderUtil_ToTrajectoryStates.vi	

'=======

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

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

Notes

X	Χ	X SI	DCMotor_GetBanebotsRs550.vi
X	Χ	X SI	DCMotor_GetBanebotsRs775.vi
X	Χ	X SI	DCMotor_GetCIM.vi
X	Χ	X SI	DCMotor_GetCurrent.vi
X	Χ	X SI	DCMotor_GetFalcon500.vi
X	Χ	X SI	DCMotor_GetMiniCIM.vi
X	Χ	X SI	DCMotor_GetNEO.vi
X	Χ	X SI	DCMotor_GetNEO550.vi
X	Χ	X SI	DCMotor_GetRomiBuiltIn.vi
X	Χ	X SI	DCMotor_GetSpeed.vi
X	Χ	X SI	DCMotor_GetTorque.vi
X	Χ	X SI	DCMotor_GetVex775Pro.vi
X	Χ	X SI	DCMotor_New.vi
X	Χ	X SI	DCMotor_PickMotor.vi
X	Χ	X 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			
	Χ	X		X				LinearSystemId_CreateElevatorSystem.vi		Update to use create matrix			
	Χ	X		Χ				LinearSystemId_CreateFlywheelSystem.vi		Update to use create matrix			
	Χ	X		Χ				LinearSystemId_CreateSingleJointedArmSystem.vi		Update to use create matrix			
	X	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 Optimizec	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE POSE ESTIMATOR	Χ	X		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	X		X				DiffDrivePoseEst_SetVisionMeasurementStdDevs.vi					
	Χ	X		X				DiffDrivePoseEst_Update.vi					
	Χ	X		X				DiffDrivePoseEst_UpdateWithTime.vi					
	Χ	X		X				DiffDrivePoseEst_VisionCorrect_Callback.vi					
	Χ	X		X				DiffDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi					

DIFFERENTIAL DRIVE POSE ESTIMATOR

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X	Χ		X				DiffDrivePoseEst2_AddVisionMeasurement.vi					
Χ		Χ	NO	SI			DiffDrivePoseEst2_BufferDuration.vi					
Χ	Χ		X				DiffDrivePoseEst2_GetEstimatedPosition.vi					
Χ	Χ	Χ	No				DiffDrivePoseEst2_InterpRecord_ExtractFromVar.vi					
	X	X X	XX	X X X	X X X	X X X	X	X X DiffDrivePoseEst2_GetEstimatedPosition.vi	X X X DiffDrivePoseEst2_AddVisionMeasurement.vi X X NO SI DiffDrivePoseEst2_BufferDuration.vi X X X X DiffDrivePoseEst2_GetEstimatedPosition.vi	X X X DiffDrivePoseEst2_AddVisionMeasurement.vi X X NO SI DiffDrivePoseEst2_BufferDuration.vi X X X X X DiffDrivePoseEst2_GetEstimatedPosition.vi	X X X DiffDrivePoseEst2_AddVisionMeasurement.vi X X NO SI DiffDrivePoseEst2_BufferDuration.vi X X X X X DiffDrivePoseEst2_GetEstimatedPosition.vi	X X X DiffDrivePoseEst2_AddVisionMeasurement.vi X X NO SI DiffDrivePoseEst2_BufferDuration.vi X X X X X DiffDrivePoseEst2_GetEstimatedPosition.vi

4 2/11/2023 – Added new pose est2		$\overline{}$								
		Χ		No			DiffDrivePoseEst2_InterpRecord_Interp.vi			
	X	X		No			DiffDrivePoseEst2_InterpRecord_New.vi			
	X	Χ		Χ			DiffDrivePoseEst2_New.vi			
	X	Χ		Χ			DiffDrivePoseEst2_ResetPosition.vi			
	X	Χ		Χ			DiffDrivePoseEst2_SetVisionMeasurementStdDevs.vi			
	X	Χ		Χ			DiffDrivePoseEst2_Update.vi			
	X	Χ		X			DiffDrivePoseEst2_UpdateWithTime.vi			
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EXTENSES NACINANT IETE	X	X		X			ExtendedKalmanFilter Correct.vi Just a shell, not functional!			
	X	X		X		+	ExtendedKalmanFilter_GetP_Single.vi			
	X	X		X		+	ExtendedKalmanFilter GetP.vi			
	X	X	$\overline{}$	X		+	ExtendedKalmanFilter_GetXHat_Single.vi			
	X	X		X		+	ExtendedKalmanFilter GetXHat.vi			
	X	X	$\overline{}$	X		+	ExtendedKalmanFilter New.vi			
	X	X		X		+	ExtendedKalmanFilter Predict.vi			
	X	X	\vdash	X		+	ExtendedKalmanFilter Reset.vi			
	X	X		X		+	ExtendedKalmanFilter SetP.vi			
	X	X		X		+	ExtendedKalmanFilter SetXHat Single.vi			
	X	X		X		+	ExtendedKalmanFilter SetXHat.vi			
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SWERVE DRIVE POSE ESTIMATO	OR X X		Wenu	ecution Optimize	Test Routine	VI Name SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
SWERVE DRIVE POSE ESTIMATO	OR		Wenu X	ecution Optimize	Test Routine	VI Name SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
SWERVE DRIVE POSE ESTIMATO	OR		Wenu X X X	ecution Optimize	Test Routine	VI Name SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_Kalman_F_Callback.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
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SWERVE DRIVE POSE ESTIMATO	X X X X X X X X X X X X X X X X X X X		X X X X X X	ecution Optimize	Test Routine	VI Name SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_Kalman_F_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_New.vi SwerveDrivePoseEst_ResetPosition.vi SwerveDrivePoseEst_ResetPosition.vi SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi SwerveDrivePoseEst_Update.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
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LINEAR QUADRATIC REGULATOR		X X X X X X X X X X X X X X X X X X X	Not	X	Optimized Exec	X X	LinearQuadraticRegulator_Calculate_NextR.vi LinearQuadraticRegulator_Calculate.vi LinearQuadraticRegulator_GetK_Single.vi LinearQuadraticRegulator_GetK.vi LinearQuadraticRegulator_GetR_Single.vi LinearQuadraticRegulator_GetR.vi LinearQuadraticRegulator_GetU_Single.vi LinearQuadraticRegulator_GetU_vi LinearQuadraticRegulator_GetU.vi LinearQuadraticRegulator_LatencyCompensate.vi LinearQuadraticRegulator_New_ELMS.vi LinearQuadraticRegulator_New_N.vi LinearQuadraticRegulator_New_Raw.vi LinearQuadraticRegulator_New_SystemELMS.vi LinearQuadraticRegulator_New_SystemELMS.vi LinearQuadraticRegulator_New_SystemELMS.vi LinearQuadraticRegulator_New_N.vi	Function Prototype	NOT ORIGINAL Routine exists, but it only has	Review Code Review	rogram Test Program	Shecking Error Checking
LINEAR QUADRATIC REGULATOR		X X X X X X X X X X X X X X X X X X X	Not	X	Optimized Exec	Routine X X Test	LinearQuadraticRegulator_Calculate_NextR.vi LinearQuadraticRegulator_Calculate.vi LinearQuadraticRegulator_GetK_Single.vi LinearQuadraticRegulator_GetK.vi LinearQuadraticRegulator_GetR_Single.vi LinearQuadraticRegulator_GetR.vi LinearQuadraticRegulator_GetU_Single.vi LinearQuadraticRegulator_GetU_vi LinearQuadraticRegulator_GetU.vi LinearQuadraticRegulator_LatencyCompensate.vi LinearQuadraticRegulator_New_ELMS.vi LinearQuadraticRegulator_New_N.vi LinearQuadraticRegulator_New_Raw.vi LinearQuadraticRegulator_New_SystemELMS.vi LinearQuadraticRegulator_New_SystemELMS.vi LinearQuadraticRegulator_New_SystemELMS.vi LinearQuadraticRegulator_New_N.vi	Function Prototype	NOT ORIGINAL Routine exists, but it only has	Je Review Code Review	Program Test	or Checking
LINEAR QUADRATIC REGULATOR		X X X X X X X X X X X X X X X X X X X	Not	X	ution Optimized Exec	st Routine X X Test	LinearQuadraticRegulator_Calculate_NextR.vi LinearQuadraticRegulator_Calculate.vi LinearQuadraticRegulator_GetK_Single.vi LinearQuadraticRegulator_GetK.vi LinearQuadraticRegulator_GetR_Single.vi LinearQuadraticRegulator_GetR.vi LinearQuadraticRegulator_GetU_Single.vi LinearQuadraticRegulator_GetU_vi LinearQuadraticRegulator_GetU.vi LinearQuadraticRegulator_LatencyCompensate.vi LinearQuadraticRegulator_New_ELMS.vi LinearQuadraticRegulator_New_N.vi LinearQuadraticRegulator_New_Raw.vi LinearQuadraticRegulator_New_SystemELMS.vi LinearQuadraticRegulator_New_SystemELMS.vi LinearQuadraticRegulator_New_SystemELMS.vi LinearQuadraticRegulator_New_N.vi	Function Prototype	NOT ORIGINAL Routine exists, but it only has	Code Review Code Review	Test Program	Error Checking

X	X	X	I	LinearSystem_CalculateY.vi LinearSystem_CalculateY.vi
X	X	X	SI	LinearSystem_GetA.vi
X	X	X	SI	LinearSystem_GetAElement.vi
X	X	X	SI	LinearSystem_GetB.vi LinearSystem_GetB.vi
X	X	X	SI	LinearSystem GetBElement.vi
X	X	X	SI	LinearSystem_GetC.vi
X	X	X	SI	LinearSystem_GetC.vi LinearSystem_GetCElement.vi
Χ	X	X	SI	LinearSystem_GetD.vi
X	X	X	SI	LinearSystem_GetD.vi LinearSystem_GetDElement.vi
X	X	X	SI	LinearSystem_New.vi

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program MBN IA		Code Review	Test Program	Error Checking
LINEAR SYSTEM LOOP				Χ				ystemLoop_ClampInput.vi			
	Х	X		Χ			LinearS	ystemLoop_Correct.vi			
	V			V			LinearS	ystemLoop_GetClampFunction.vi			
	X	X		X				ystemLoop_GetController.vi ystemLoop_GetError_Single.vi			
		X		X			LinearS	ystemLoop_GetError.vi			
		\hat{X}		X			LinearS	ystemLoop_GetFeedForward.vi			
		X		X			LinearS	ystemLoop_GetNextR_Single.vi			
		X		X			LinearS	ystemLoop_GetNextR.vi			
	X	Χ		Х			LinearS	ystemLoop_GetObserver.vi			
		Χ		X			LinearS	ystemLoop_GetU_Row.vi			
	Χ	Χ		X			LinearS	ystemLoop_GetU.vi			
		Χ		Χ			LinearS	ystemLoop_GetXHat_Single.vi			
	Χ	Χ		X				ystemLoop_GetXHat.vi			
							LinearS	ystemLoop_New_BBB			
	V/			\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \				ystemLoop_New_LinearSystem_ClampFunc			
	X	X		X			LinearS	ystemLoop_New_LinearSystem_ClampVal.vi ystemLoop_New.vi			
		X		X				ystemLoop_New.vi			
	\hat{x}	\hat{x}		X			LinearS	ystemLoop_Reset.vi			
	^						LinearS	ystemLoop_SetClampFunction.vi			
							LinearS	ystemLoop_SetNextR_Some.vi			
	Х	Χ		Х				ystemLoop_SetNextR.vi			
							LinearS	ystemLoop SetXHat Single.vi			
							LinearS	ystemLoop_SetXHat.vi			
LTV DIFFERENTIAL DRIVE CONTROLLER	X Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine	Sample Program Man IV Sample Program	e Function Prototype Notes DriveCtrl_Calculate.vi	Code Review	Test Program	Error Checking
		X		X			I TVDiff	DriveCtrl_New.vi			
	Χ	Χ		X			LTVDiff	DriveCtrl_Calculate_TrajState.vi			
		Χ		Χ			LTVDiff	DriveCtrl_Calculate_SetTolerance.vi			
	X	Χ		Χ			LTVDiff	DriveCtrl_Calculate_AtReference.vi			
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program IN weN	e Function Prototype Notes	Code Review	Test Program	Error Checking
LTV UNICYCLE CONTROLLER	X			X		X		cycleCtrl_AtReference.vi			

X	X	X	X	LTVUnicycleCtrl_Calculate_TrajState.vi
X	X	X	Χ	LTVUnicycleCtrl_Calculate.vi
X	X	X	Χ	LTVUnicycleCtrl_New.vi
X	X	X	Χ	LTVUnicycleCtrl_SetEnabled.vi
X	X	X	Χ	LTVUnicycleCtrl_SetTolerance.vi

'======== STATE SPACE UTILITIES '========

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
CALLBACK HELPER	Χ	X	X	X			CallbackHelp_MatrixMinus.vi					
	Χ	X	X	Χ			CallbackHelp_MatrixMult_CoerceSizeB.vi					
	Χ	X	X	Χ			CallbackHelp_MatrixMult.vi					
	Χ	X	X	X			CallbackHelp_MatrixPlus.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimi.	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DISCRETIZATION	Χ	X		X		Χ		Discretization_DiscretizeA.vi					
	Χ	X		Χ		Χ		Discretization_DiscretizeAB.vi					
	Χ	X		X		X		Discretization_DiscretizeABTaylor.vi					
	Χ	X		X		X		Discretization_DiscretizeAQ.vi					
	Χ	Χ		Χ		Χ		Discretization_DiscretizeAQTaylor.vi					
	Χ	Χ		Χ				Discretization_DiscretizeR.vi					

	Implemented	Documented	Not WPILIB	Menu Item	; ;	Execution Optim	Test Routine	Sample Program	Function Prototype		Notes	Code Review	Test Program	Error Checking
STATE SPACE UTIL	X	X	X	No)			StateSpaceUtil_Check_Stabalizable.vi			Internal routine			
	Χ	X		X				StateSpaceUtil_ClampInputMaxMagnitude.vi			Routine exists, it is just a shell			
	Χ	X		X				StateSpaceUtil_IsDetectable.vi						
	Χ	X		X				StateSpaceUtil IsStabalizable.vi						
	Χ	X		X			X	StateSpaceUtil_MakeCostMatrix.vi						
	Χ	X		X			Χ	StateSpaceUtil MakeCovarianceMatrix.vi						
	Χ	X		X				StateSpaceUtil MakeWhiteNoiseVector.vi						
	Χ	X		X				StateSpaceUtil_NomalizeInputVector.vi						
	Χ	Χ		X				StateSpaceUtil_PoseTo3dVector.vi						
	Χ	X		X				StateSpaceUtil_PoseTo4dVector.vi						
	Χ	X		X				StateSpaceUtil_PoseToVector.vi						
										-				

'======== SIMULATION

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X

Χ

Χ

X

Χ

DiffDriveTrainSim New.vi

DiffDriveTrainSim SetInputs.vi

DiffDriveTrainSim_SetPose.vi

DiffDriveTrainSim SetState.vi

DiffDriveTrainSim Update.vi

DiffDriveTrainSim SetCurrentGearing.vi

DiffDriveTrainSim ToughBoxMiniGearRatio.vi

DiffDriveTrainSim_ToughBoxMiniMotor.vi

WPILib LabVIEW Math Library - VI Implementation List Revision 3.04 2/11/2023 – Added new pose est2 Routine Function Prototype VI Name Notes BatterySim CalculateDefaultBatteryLoadedVoltage.vi BATTERY SIM X X SI X SI BatterySim CalculateLoadedVoltage.vi XX BatterySim Execute.vi VI Name Function Prototype DC MOTOR SIM X DCMotorSim Execute.vi X X X X X DCMotorSim_getAngularPositionRad.vi X DCMotorSim getAngularPositionRotations.vi DCMotorSim getAngularVelocityRadPerSec.vi XX Χ XX X DCMotorSim_getAngularVelocityRPM.vi Χ DCMotorSim GetCurrentDrawAmps.vi X DCMotorSim New MOI.vi Χ Χ Χ Χ DCMotorSim New Plant.vi X X X Χ DCMotorSim Pack Model Params.vi X X X DCMotorSim SetInputVoltage.vi XX X DCMotorSim_Update.vi Function Prototype Notes DIFFERENTIAL DRIVE TRAIN SIM X X DiffDriveTrainSim_ClampInput.vi X X DiffDriveTrainSim CreateKitbotSim EstMass.vi DiffDriveTrainSim CreateKitbotSim EstMassMOI.vi Χ X X DiffDriveTrainSim CreateKitbotSim.vi X DiffDriveTrainSim_GetCurrentDrawAmps.vi XX Χ XX Χ DiffDriveTrainSim GetCurrentGearing.vi DiffDriveTrainSim GetDynamics.vi $X \mid X$ X XX DiffDriveTrainSim GetHeading.vi Χ DiffDriveTrainSim GetLeftCurrentDrawAmps.vi Χ Χ XX DiffDriveTrainSim GetLeftPositionMeters.vi Χ XX X DiffDriveTrainSim GetLeftVelocityMetersPerSecond.vi XX X DiffDriveTrainSim GetOutput Single.vi XX Χ DiffDriveTrainSim GetPose.vi DiffDriveTrainSim_GetRightCurrentDrawAmps.vi XX X XX Χ DiffDriveTrainSim GetRightPositionMeters.vi DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi Χ X XX Χ DiffDriveTrainSim GetState Single.vi XX X DiffDriveTrainSim GetState.vi XX Χ DiffDriveTrainSim KitBotWheelSize.vi XX X DiffDriveTrainSim New Mass MOI.vi

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	Implemented Documented Not WPILIB	Menu Item	Execution Optimiz	Test Routine		VI Name	Function Prototype	Notes	Code Review	Test Program	
ELEVATOR SIM	X X	X				ElevatorSim_Execute.vi					
	X X	X				ElevatorSim_GetCurrentDraw.vi					
	XX	X				ElevatorSim_GetPositionMeters.vi ElevatorSim_GetVelocityMetersPerSecond.vi					
	X X X X	X				ElevatorSim HasHitLowerLimit.vi					
	$\begin{array}{c c} X & X \\ \hline X & X \\ \hline \end{array}$	X				ElevatorSim_HasHitUpperLimit.vi					
						ElevatorSim_New_LinSys_NoNoise.vi					
						ElevatorSim_New_LinSys.vi					
	V V	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \				ElevatorSim_New_NoNoise.vi					
	X X X	X				ElevatorSim_New.vi ElevatorSim_Pack_Model_Params.vi					
	x x	X				ElevatorSim Pack Simulation Params.vi					
	X X X	No				ElevatorSim RKF45 Func.vi					
	XX	X				ElevatorSim_SetInputVoltage.vi					
	X X	Х				ElevatorSim_SetState.vi					
	$X \mid X \mid X$	X				ElevatorSim_Update.vi		Needed because this doesn't extend.			
	X X	X				ElevatorSim_UpdateX.vi		extend.			
	XX	X				ElevatorSim_WouldHitLowerLimit.vi					
	XX	X				ElevatorSim_WouldHitUpperLimit.vi					
	ole cu	กนะ	ecn	st R	трк				de R	st Pro	
FLYWHEEL SIM	X Implemented Documented X Not WPILIB	X Menu Item	Execution	Test Routine		VI Name FlyWheelSim Execute.vi	Function Prototype	Notes	Code R	Test Pr	
FLYWHEEL SIM	X X X	X	Execu	Test R		FlyWheelSim_Execute.vi FlyWheelSim_GetAngularVelocityRadPerSec.vi	Function Prototype	Notes	Code R	Test Pr	
FLYWHEEL SIM	X X X X X X X X X X X X X X X X X X X	X X X	Execu	Test R		FlyWheelSim_Execute.vi FlyWheelSim_GetAngularVelocityRadPerSec.vi FlyWheelSim_GetAngularVelocityRPM.vi	Function Prototype	Notes	Code R	Test Pr	
FLYWHEEL SIM	X X X	X	Execu	Test R		FlyWheelSim_Execute.vi FlyWheelSim_GetAngularVelocityRadPerSec.vi FlyWheelSim_GetAngularVelocityRPM.vi FlyWheelSim_GetCurrentDrawAmps	Function Prototype		Code Ri	Test Pr	
FLYWHEEL SIM	X X X X X X X X X X X X X X X X X X X	X X X	Execu	Test R		FlyWheelSim_Execute.vi FlyWheelSim_GetAngularVelocityRadPerSec.vi FlyWheelSim_GetAngularVelocityRPM.vi FlyWheelSim_GetCurrentDrawAmps FlyWheelSim_New_LinSys	Function Prototype	Future	Code Ri	Test Pn	
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Revision 3.04 2/11/2023 – Added new pose est2				7			-				
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		Z Z	<u> </u>	()	(N/A		CONTRAINED STATE.CTL						
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		Z	Z		N/A		ELEVATOR_SIM_MODEL_PARAMS.CTL						
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		Z Z	2 X		(N/A		EXTENDED KALMAN FILTER.CTL						
		ZZ			(N/A		FLYWHEEL_SIM.ctl						
		Z		?	N/A		FLYWHEEL_SIM_MODEL_PARAMS.CTL						
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Z	Z	X	X	N/A	FUNCTION_GENERATOR_MATRIX.ctl	
Z	Z	X	X	N/A N/A	FUNCTION_GENERATOR.ctl HOLONOMIC DRV CTRL.CTL	New 1/26/21
Z	Z	X	$\frac{\lambda}{X}$	N/A N/A	KALMAN FILTER LATENCY COMP FUNC GROUP.CTL	New 1/20/21
Z	Z	X	\hat{x}	N/A	KALMAN FILTER LATENCY COMP.CTL	
Z	Z	X	X	N/A	KALMAN FILTER.ctl	
Z	Z	X	X	N/A	LINEAR FILTER.CTL	
Z	Ζ	X	X	N/A	LINEAR PLANT INV FF.ctl	
Z	Ζ	Х	Χ	N/A	LINEAR_QUADRATIC_REGULATOR.ctl	
Z	Ζ	Χ	Χ	N/A	LINEAR_SYSTEM_LOOP.ctl	
Z	Ζ	X	Χ	N/A	LINEAR_SYSTEM_SIM.ctl	
Z	Ζ	X	Χ	N/A	LINEAR_SYSTEM.ctl	
Z	Z	X	X	N/A	LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl	
Z N/A	Ζ	X N/A	Χ	N/A N/A	LTV_DIFF_DRIVE_CTRL.ctl LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl	OBSOLETE – Removed
Z	Z	X	X	N/A	LTV_UNICYCLE_CONTROLLER_INFUT_ENUM.ctl	OBSOLETE - Reilloved
Z	Z	X	X	N/A	LTV_UNICYCLE_CONTROLLER.CTL	
Z	Z	X	X	N/A	MECA DRIVE KINEMATICS.CTL	
Z	Z	X	X	N/A	MECA DRIVE ODOMETRY.CTL	
Z	Ζ	Х	Χ	N/A	MECA_DRIVE_POSE_EST.CTL	
Ζ		Χ	Χ	N/A	MECA_DRIVE_POSE_EST2.ctl	
Ζ		Χ	Χ	N/A	MECA_DRIVE_POSE_EST2_INTERP_RECORD.CTL	
Z	Z	X	X	N/A	MECA_WHEEL_POSITIONS.CTL	
Z	Z	X	X	N/A	MECA_WHEEL_SPEEDS.CTL	
Z 7	<i>Z</i>	X	X	N/A	MEDIAN_FILTER.CTL MERWE_SCALED_SIGMA_PTS.ctl	
Z Z	Z	X	X	N/A N/A	OBSERVER SNAP LIST ITEM.CTL	
Z	Z	X	X	N/A N/A	OBSERVER_SNAP_LIST_TIEM.CTL 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	X	N/A	PID_ADV_LIMITS.CTL	
Z	Ζ	Χ	Χ	N/A	PID_ADV_TUNING.CTL	
Ζ	Ζ	X	Χ	N/A	PID_CONTROLLER.CTL	
Z	Ζ	X	Χ	N/A	PID_ERROR_TOLERANCE.CTL	
Z	Z	X	Χ	N/A	PID_INPUT_LIMITS.CTL	
Z	Z	X	X	N/A	PID_TUNING.CTL	
Z	Z	X	X	N/A N/A	POSE2D.CTL POSE3D.CTL	
Z Z	Z	X	X	N/A	POSESDICTE POSEWCURVATURE.CTL	
Z	Z	X	\hat{x}	N/A	PROFILED PID CONTROLLER.CTL	
Z	Z	X	X	N/A	QUATERNION.CTL	
Z	Z	X	X	N/A	RAMSETE EXE TUNING.CTL	
Z	Ζ	Χ	Χ	N/A	RAMSETE.CTL	
Z	Ζ	X	Χ	N/A	ROTATION2D.CTL	
Z	Ζ	X	Χ	N/A	ROTATION3D.CTL	
Z	Z	X		N/A	SIMPLE_MOTOR_FF_KA_TUNE_PARAMS.CTL	
Z	Z	X		N/A	SIMPLE_MOTOR_FF.CTL	
Z	Ζ	X	Χ	N/A N/A	SINGLE_JOINT_ARM_SIM.CTL SINGLE JOINT_ARM_SIM_MODEL_PARAMS.CTL	
Z		X		N/A N/A	SINGLE JOINT ARM SIM SIMULATION PARAMS.CTL	
Z	Z	X	X	N/A	SLEW RATE LIMITER.CTL	
Z	Z	X	X	N/A	SPLINE CTRL VECTOR.CTL	
Z	Z	X	X	N/A	SPLINE.CTL	
Z	Ζ	X	Χ	N/A	SWERVE_DRIVE_KINEMATICS.CTL	
Ζ	Ζ	X	Χ	N/A	SWERVE_DRIVE_MODULE_POSITION.CTL	
Ζ	Ζ	X	Χ	N/A	SWERVE_DRIVE_MODULE_STATE.CTL	
Z	Z	X	X	N/A	SWERVE_DRIVE_ODOMETRY.CTL	
Z	Z	X	X	N/A	SWERVE_DRIVE_Pose_EST.CTL	
		X	X No	N/A N/A	SWERVE_DRIVE_POSE_EST2.ctl SWERVE_DRIVE_POSE_EST2_INTERP_RECORD.CTL	
Z	Z	X	X	N/A N/A	TIME INTERPOLATABLE BOOLEAN.CTL	
Z	Z	X	\hat{x}	N/A	TIME INTERPOLATABLE DOUBLE.CTL	
Z	Z	X	X	N/A	TIME INTERPOLATABLE POSE2D.CTL	
Z	Z	X		N/A	TIME INTERPOLATABLE ROTATION2D.CTL	
Z	Z	X		N/A	TIME_INTERPOLATABLE_VARIANT.CTL	
Ζ	Ζ	Χ	Χ	N/A	TIMER.CTL	
Z	Ζ	X	Χ	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	
Ζ	Ζ	X	Χ	N/A	TRAJ_CONSTRAINT_DIIF_DRIVE_VOLTAGE.CTL	

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	Ζ	Χ	Χ	N/A	TRAJ_CONSTRAINT_ELLIP_REGION.CTL	
1		Χ		N/A	TRAJ_CONSTRAINT_JERK.CTL	Routine exists, it is just a shell
Ζ	Z	X	Χ	N/A	TRAJ_CONSTRAINT_MAX_VELOCITY.CTL	
Z	Ζ	Χ	Χ	N/A	TRAJ_CONSTRAINT_MECA_DRIVE_KINEMATICS.CTL	
Z	Ζ	Χ	Χ	N/A	TRAJ_CONSTRAINT_MINMAX.CTL	
Z	Ζ	Χ	Χ	N/A	TRAJ_CONSTRAINT_RECT_REGION.CTL	
Z	Ζ	Χ	Χ	N/A	TRAJ_CONSTRAINT_SWERVE_DRIVE_KINEMATICS.CTL	
Z	Ζ	Χ	Χ	N/A	TRAJ_STATE.CTL	
Z	Ζ	Χ	Χ	N/A	TRAJECTORY_SPLINE_TYPE_ENUM.CTL	
Z	Ζ	Χ	Χ	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	Ζ	Χ	Χ	N/A	TRAPEZOID_PROFILE_CONSTRAINT.CTL	
Z	Ζ	Χ	Χ	N/A	TRAPEZOID_PROFILE_STATE.CTL	
Z	Ζ	Χ	Χ	N/A	TRAPEZOID_PROFILE.CTL	
Z	Ζ	Χ	Χ	N/A	TWIST2D.CTL	
Z	Ζ	Χ	Χ	N/A	TWIST3D.CTL	
Z	Ζ	Χ	Χ	N/A	UNSCENTED_KALMAN_CORRECT_FUNC_GROUP.CTL	
Z	Ζ	Χ	Χ	N/A	UNSCENTED_KALMAN_FILTER.ctl	
Z	Ζ	Χ	X	N/A	UNSCENTED_KALMAN_NEW_FUNC_GROUP.CTL	
Z	Ζ	Χ	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
Ζ	Ζ	Χ	Χ	N/A	X_Y_PAIR.CTL	

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