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 (I) CTRL Shell Total (I) CTRL Shell Total (I) CTRL Shell Total (I) 2

Doc completed Pct 98.57% 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

ANALOG DELAY	X Implemented	X Documented X Not Well IR		X Menu item	eu.		VI Name AnalogDelay_Execute.vi	Function Prototype	Notes Similar to interpolated tree map	Code Review	Test Program	Error Checking
BUMPLESS TRANSFER	X Implemented	X Documented X Not With IR		X Menu Item	Test Routine		VI Name BumplessTransfer Execute.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
BOMM EEGO MOANO! EIX	Implemented	Documented >>	n	Menu Item	Test Routine	mple Program		Function Prototype	Notes	Code Review	Test Program	Error Checking
FUNCTION GENERATOR	X	X		X			FunctionGenerator_Add_Value.vi FunctionGenerator_Add_XY.vi FunctionGenerator_Calculate.vi		Similar to interpolated tree map Similar to interpolated tree map Similar to interpolated tree map			
	X	X X X X	· ·	X S X I X S			FunctionGenerator_Clear.vi FunctionGenerator_Execute.vi FunctionGenerator_New.vi		Similar to interpolated tree map Similar to interpolated tree map			
FUNCTION GENERATOR MATRIX	X	X X X Documented	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	X X X Menu Item N X X Menu Item N I Execution Optimized	Test Routil		VI Name FunctionGeneratorMatrix_Add.vi FunctionGeneratorMatrix_Calculate.vi FunctionGeneratorMatrix_New.vi	Function Prototype	Notes Similar to interpolated tree map Similar to interpolated tree map Similar to interpolated tree map	Code Review	Test Program	Error Checking

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 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 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 SlewRateLimiter_SetRate.vi

	Implemented Documented	WPILIB	ı Item	Execution Optimi:	Test Routine Sample Program				Code Review	Program	:
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TIMER	$X \mid X$	<u> </u>	X	Щ	<u> </u>	Timer Close.vi	Function Frototype	releases semaphore			<u> </u>
	XX		X		X	Timer_Get.vi		· ·			
	X X	X				Timer_GetAndReset.vi					
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		X	X			Timer_HasPeriodPassedOnce.vi					
	X X		X			Timer_New.vi					
	X X X X	X	X No		X	Timer_Reset.vi Timer ResetInternal		Internal (private) only			
	X X	X	X			Timer_Restart.vi		internal (private) only			
	XX		Χ		X	Timer_Start.vi					
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	Implemented Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	
TIME INTERPOLATABLE BOOLEAN	X X	X	X	I		TimeInterpBoolean_AddSample.vi		Update to use create matrix			
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/11/2023 – Added new pose est2			1	1	-			T					
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	X	X	X	No X) I SI			TimeInterpVariant_CleanUp.vi TimeInterpVariant_Clear.vi		Update to use create matrix			
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								TimeInterpVariant_GetTimeForValue.vi					
	Χ	X	X	X	1			TimeInterpVariant_Interpolate.vi		This is a template for a user			
			ļ							created routine.			
	X	X	X	X	SI	-		TimeInterpVariant_New.vi					
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BOUNCER	Χ	X		Χ		Debouncer_New.vi			
	Χ	X		Χ		Debouncer_Calculate.vi			
	Χ	X	X	Χ		Debouncer_Execute.vi			
	Χ	X		No		Debouncer_Reset.vi			
	Χ	X		No		Debouncer_HasElapsed.vi			

'======= CONTROLLER

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		Doc	Not	Me	Exe	7es	ຶ່ນ VI Name	Function Prototype	Notes	S	7es	Error
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	Χ	Χ		Χ		<u> </u>	ArmFF_CalculateVelocityOnly.vi		1.1745744 1.1 1.1 1.1			
			X			-	ArmFF_Execute.vi ArmFF_ExecuteVelocityOnly.vi		LabVIEW style single call LabVIEW style single call			
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	X	Χ		X			ArmFF_MinAchieveVelocity.vi					
	Χ	X		Χ		\perp	ArmFF_New_ZeroGravity.vi					
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BANG BANG	2 ×	X	_ <	<u>≥</u>	SI		BangBang_AtSetpoint.vi	Function Prototype	Notes	<u> </u>		
DANG DANG	X	X		X	SI	\vdash	BangBang_Calculate_PV.vi					
	X	X		X	SI		BangBang_Calculate_SP_PV.vi					
	Χ	Х	X	X	SI		BangBang_Execute.vi					
	X	X		X	SI		BangBang_GetAll.vi					
	X	X		Χ	SI		BangBang_GetError.vi					——
	Χ	X		Χ	SI		BangBang_New.vi					
	X	X		X	SI	-	BangBang_SetSetpoint.vi					
	X	X		X	SI		BangBang_SetTolerance.vi					
	nplemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Obsorbing
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ONTROLLER UTIL	L X	X		X	Optimized 9		ControllerUtil_GetModulusError.vi		This was short lived in WPILIB, but still useful here.	Review		z zi Jood O z c
	Implemented X	Documented	Not WPILIB	Menu Item X	SI	Test Routine	ControllerUtil_GetModulusError.vi	Function Prototype	This was short lived in WPILIB, but		Test Program	
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	XX	X				ElevFF_MaxAchieveVelocity.vi					
	XX	X				ElevFF_MinAchieveAccel.vi					
	XX	X				ElevFF_MinAchieveVelocity.vi					
	XX	X				ElevFF_New_ZeroAccel.vi					
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HOL_DRV_CTRL		XX				HolDrvCtrl_AdvCalculate_Trajectory.vi		Added 1/24/2022			
	XX	XX				HolDrvCtrl_AdvCalculate.vi		Added 1/24/2022			
	XX	X	SI			HolDrvCtrl_AtReference.vi		Added 1/26/21			
	XX	X	1			HolDrvCtrl_Calculate_Trajectory.vi		Added 1/26/21			
	XX	X	1			HolDrvCtrl_Calculate.vi		Added 1/26/21			
	XX	X X				HolDrvCtrl_Execute_Trajectory.vi		Added 1/24/2022			
		X X				HolDrvCtrl_Execute.vi		Future			
	XX	X	SI			HolDrvCtrl_New.vi		Added 1/26/21			
	XX	XX	SI			HolDryCtrl_PackExecuteSP.vi		Add-d 4/04/0000			
	X X X X	X X X X				HolDrvCtrl_PackPID.vi HolDrvCtrl PackProfPID.vi		Added 1/24/2022			
	X X X X	^ X	SI			HolDrvCtrl_PackProfPlD.vi HolDrvCtrl_SetEnabled.vi		Added 1/24/2022 Added 1/26/21			
	X X	Y	SI			HolDrvCtrl SetTolerance.vi		Added 1/26/21			
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	Implemented Documented	Not WPILIB Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Protetune	Notes	Code Review	Test Program	Error Checking
PID AUTOTUNE		<u>≥</u> ≥ X No			ν	PIDAutoTune ClosedLoopStep.vi	Function Prototype	Notes	O		
FID AUTOTONE		X No				PIDAutoTune_ClosedLoop3tep.vi PIDAutoTune_Convert_Academic_To_NonInteracting.vi					
		X No				PIDAutoTune OpenLoopStep.vi					
	XX	X X				PIDAutoTune_SetTuningArguments.vi					-
	XX	XX				PIDAutoTune_Step_Execute.vi					
PID CONTROLLER	Implemented Documented	X Not WPILIB X Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes Advanced PID	Code Review	Test Program	Error Checking
PID CONTROLLER	X X X X					PIDController_AdvCalculate_FF_Sp_Pv_Per.vi PIDController_AdvCalculate_FF_Sp_Pv_vi		Advanced PID Advanced PID			
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	XX		SI			PIDController_AtSetpoint.vi					
	XX	X				PIDController_Calculate_PV.vi					
	XX	X				PIDController_Calculate_SP_PV.vi					
	XX		SI			PIDController_DisableContinousInput.vi					
	XX	X	SI		14	PIDController_EnableContinousInput.vi		Labrian atula la la ca			
	X X	XX			Х	PIDController_Execute.vi PIDController GetContinuousError.vi		Labview style helper OBSOLETE – Removed			
	XX	V	SI			PIDController_GetContinuousError.vi PIDController_GetPeriod.vi		ODSOLETE - Kemoved			
	XXX	X Y	SI	_		PIDController_GetPeriod.vi	+				
	XXX	^	SI			PIDController_GetPiD.vi PIDController_GetPositionError.vi					
	$\begin{array}{c c} X & X \\ \hline X & X \\ \hline \end{array}$	X	SI			PIDController_GetSetpoint.vi					
	$\begin{array}{c c} X & X \\ \hline X & X \\ \hline \end{array}$	X	SI			PIDController GetTolerance.vi					
	X X	$\frac{x}{x}$	SI			PIDController_GetVelocityError.vi					
	XX	X	SI			PIDController_IsContinuousInputEnabled.vi					
	XX	X	1			PIDController_New.vi					
	XX	X	1			PIDController_NewPeriod.vi					
	XX	XX	SI			PIDController_Pack_AdvLimits.vi					
	XX	XX	SI			PIDController_Pack_AdvTuning.vi					
	XX	$X \mid X$	SI			PIDController_Pack_ErrorTolerance.vi					

X X X X X	X X	X X X X No	SI SI SI		PIDController_Pack_InputLimits.vi PIDController_Pack_Tuning.vi PIDController_Reset.vi PIDController_SetD.vi PIDController_SetDerivativeFilter.vi					
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X	X						Advanced PID			
X		No			PIDController_SetFeedForward_OBSOLETE_DELETE.vi		Advanced PID, Obsolete –			
X		No	_	_			DELETE			
X		4 7			PIDController_SetFFGain_OBSOLETE_DELETE.vi		Advanced PID, Obsolete – DELETE			
X		X	SI		PIDController Setl.vi		DELETE			
		Ĥ	Ŭ,		PIDController_SetInputRange.vi	_	OBSOLETE - Removed			
		Х	SI		PIDController_SetIntegratorRange.vi		05002212 1100100			
X	X	X	SI		PIDController_SetOutputLimits.vi		Advanced PID			
X		X	SI		PIDController SetP.vi					
	X				PIDController_SetPeriod.vi					
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	X	X			PIDController_SetPIDF.vi		Advanced PID			
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	\top	\overline{X}			ProfiledPIDController AtGoal.vi				•	7
					ProfiledPIDController_AtSetpoint.vi					
X					ProfiledPIDController Calculate Meas Goal.vi					
		X			ProfiledPIDController Calculate Meas StateGoal TrapCnsrt.vi					
X		X			ProfiledPIDController_Calculate_Meas_StateGoal.vi					
					ProfiledPIDController_Calculate_Meas.vi					
		X	SI							
			SI							
X	X	X	1		ProfiledPIDController_Execute.vi		Single call LabVIEW style function.			
X		X	SI		ProfiledPIDController GetGoal.vi					
X	X				ProfiledPIDController GetPID.vi		WPILIB has separate getters.			
		X			ProfiledPIDController_GetPositionError.vi					
X		X	SI		ProfiledPIDController_GetSetpoint.vi					
		X	SI		ProfiledPIDController_GetTolerance.vi					
		X	SI		ProfiledPIDController_GetVelocityError.vi					
X		X	1		ProfiledPIDController_New.vi					
		X	1		ProfiledPIDController_NewPeriod.vi					
X		X	SI		ProfiledPIDController_Reset_PosOnly.vi					
X	1	X								
					ProfiledPIDController_SetIntegratorRange.vi					
	1	X			ProfiledPIDController_SetPID.vi ProfiledPIDController SetTolerance PosOnly.vi					
X			1 01	1		-				
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		X	X			Ramsete SetEnabled.vi	SetEnabled				
		X	X			Ramsete SetTolerance.vi	SetTolerance				
		Χ	X	<i>></i>		Ramsete_SINC.vi	sinc	internal			
PLE MOTOR FEEDFORWARD	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X			VI Name SimpleMotorFF_Calculate_CalcAccel.vi SimpleMotorFF_Calculate_NextV_Dt.vi SimpleMotorFF_Calculate.vi SimpleMotorFF_Calculate.vi SimpleMotorFF_CalculateVelocityOnly.vi SimpleMotorFF_Ka_AutoTune.vi SimpleMotorFF_MaxAchieveAccel.vi SimpleMotorFF_MaxAchieveVel.vi SimpleMotorFF_MinAchieveVel.vi SimpleMotorFF_MinAchieveVel.vi SimpleMotorFF_MinAchieveVel.vi	Function Prototype public double calculate(double velocity, double acceleration) public double calculate(double velocity) public double maxAchievableAcceleration(double maxVoltage, double velocity) public double maxAchievableVelocity(double maxVoltage, double acceleration) public double minAchievableAcceleration(double maxVoltage, double velocity) public double minAchievableVelocity(double maxVoltage, double acceleration) public SimpleMotorFeedforward(double ks, double kv, double ka)		Code Review	Test Program	Error Checking
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		X	X X	S		SimpleMotorFF_Pack_Ka_Tune_Params.vi	public SimpleMotorFeedforward(double ks, double kv)				
COORDINATE AXIS	X Implemented	X Documented	Not WPILIB X Menu Item	O Exercition Ontimized	Test Routine	VI Name CoordAxis_D.vi	public SimpleMotorFeedforward(double ks, double kv) Function Prototype	Notes	Code Review	Test Program	Error Checkina
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POSEZD	X	X		X	SI			Pose2d_Div.vi	boolean equals(other obj)				
	X	X		X	X			Pose2d Exp.vi	pose2d exp(twist2d twist)				
	X	X		X	SI			Pose2d_getRotation.vi	rotation2d getRotation()	can also use cluster unpack			
	X	X		Χ	SI			Pose2d_getTranslation.vi	translation2d getTranslation()	can also use cluster unpack			
	Χ	X	X	Χ	SI			Pose2d_getXY.vi	· · · · · · · · · · · · · · · · · · ·				
	X	X	X	Χ	SI			Pose2d_getXYAngle.vi					
	X	X		Χ	I			Pose2d_Interpolate.vi					
	X	X		Χ	Χ			Pose2d_Log.vi	twist2d log(pose2d end)				
	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		X	SI SI			Pose2d_New.vi Pose2d_Plus.vi	pose2d new(double x, double y, rotation2d) pose2d plus(transform2d other)				
	X	X		X	SI			Pose2d_Flus.vi	pose2d plus(transform2d other) pose2d relativeto(pose2d other)				
	\overline{X}	\hat{x}		X	SI			Pose2d_Relative 10.vi	י איסטבע זכומוויטנטן איסטבע טוווכו				
	X	X		X	SI			Pose2d_TransformBy.vi	pose2d transformby(transform2d other)				
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POSE3D	Χ	X		Χ	SI			Pose3d_Div.vi					
	X	X		Χ	SI			Pose3d_Equals.VI					
	X	X		Χ	Χ			Pose3d_Exp.vi					
	X	X		X	SI			Pose3d_getRotation.vi					
	X	X	V	X	SI			Pose3d_getTranslation.vi					
	X	X	X	X	SI I			Pose3d_getXYZ.vi Pose3d_Interpolate.vi					-
	X	X		X	X			Pose3d_Log.vi					
	X	X		X	SI			Pose3d Minus.vi					
	X	X		X	SI			Pose3d New.vi					
	X	X		X	SI			Pose3d New Default.vi					
	X	X		X	SI			Pose3d New Pose2d.vi					
	X	X		Χ	SI			Pose3d New Trans3dRot3d.vi					
	Χ	X		Χ	SI			Pose3d_Plus.vi					
	Χ	X		Χ	SI			Pose3d_RelativeTo.vi					
	X	Χ		No	SI			Pose3d_RotationVectorToMatrix.vi					
	X	X		Χ	SI			Pose3d_ToPose2d.vi					
	X	X		X	SI			Pose3d_Times.vi					
	X	X		Χ	SI			Pose3d_TransformBy.vi					
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QUATERNION	X	X	_ <	<u>≥</u>	SI	_		Quaternion_Equals.vi	i unction i tototype	140103			H H
COALEMION	\overline{X}	X		X	SI			Quaternion_Equals.vi Quaternion_Get_All.vi					
	X	X		X	SI			Quaternion Get LVQuat.vi					
	X	X		X	SI			Quaternion_Get_Vect.vi					
	X	X		X	SI			Quaternion Get W.vi					
	X	X		X	SI			Quaternion Inverse.vi					
	X	X		X	SI			Quaternion_New.vi					
	X	Χ		Χ	SI			Quaternion_New_Default.vi					
	Χ	X		Χ	SI			Quaternion_New_LVQuat.vi					
	Χ	X		Χ	SI			Quaternion_Normalize.vi					
										-		-	

X	X	X	SI		Quaternion_Plus.vi			
X	X	X	SI		Quaternion_Times.vi			
X	X	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		X	SI			Rotation2d_CreateAngleDegrees.vi	rotation2d fromDegrees(double degrees)	convert to radians then create			
	X	Χ		Χ	SI			Rotation2d_CreateAngleRotations.vi					
	X	Χ		X	SI			Rotation2d_CreateXY.vi	rotation2d new(double x, double y)				
	Χ	X		Χ	SI			Rotation2d_Div.vi					
	Χ	X		X	SI			Rotation2d_Equals.vi	boolean equals(rotation2d other)				
	Χ	X	Χ	X	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		X	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		X	SI			Rotation2d_Interpolate.vi					
	Χ	X		X	SI			Rotation2d_Minus.vi	rotation2d minus(rotation2d other)				
	Χ	Χ		Χ	SI			Rotation2d_Plus.vi	rotation2d plus(rotation2d other)				
	Χ	Χ		X	SI			Rotation2d_RotateBy.vi	rotation2d rotateby(rotation2d other)				
	Χ	X		X	SI			Rotation2d_Times.vi	rotation2d times(double scalar)				
	Χ	Χ		X	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		Χ	1		Rotation3d_Create_RotMatrix.vi					
	Χ	Χ		Χ	SI		Rotation3d_Div.vi					
	Χ	Χ		Χ	SI		Rotation3d_Equals.vi					
	Χ	Χ	Χ	X	SI		Rotation3d_GetAxisAngle.vi					
	Χ	Χ		Χ	SI		Rotation3d_GetQuaternion.vi					
	Χ	Χ		Χ	SI		Rotation3d_GetXYZ.vi					
	Χ	Χ		X	SI		Rotation3d_Interpolate.vi					
	Χ	Χ		Χ	SI		Rotation3d_Minus.vi					
	Χ	Χ		Χ	SI		Rotation3d_Plus.vi					
	Χ	Χ		Χ	SI		Rotation3d_RotateBy.vi					
	Χ	Χ		Χ	SI		Rotation3d_Times.vi					
	Χ	Χ		Χ	SI		Rotation3d_ToRotation2d.vi					
	Χ	Χ		Χ	SI		Rotation3d_UnaryMinus.vi					
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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
TRANSFORM2D	X	X		Χ	SI		Transform2d_Create_PosePose.vi	transform2d new(pose2d, pose2d)				

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,											
	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		X	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	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		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		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 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
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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
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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
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		X	X	X	SI		Translation3d_GetDistance.vi						Х
		X		X	SI		Translation3d_GetNorm.VI						Х
		X		(X	SI		Translation3d_GetXYZ.vi						X
		X		Χ	SI		Translation3d_Interpolate.vi						Х
		X		Χ	SI		Translation3d_Minus.vi						Х
		X		X	SI		Translation3d_Plus.vi						Х
		X	X	X	SI		Translation3d_RotateBy.vi						Χ
		X		X			Translation3d_Times.vi						Х
		X	X	X	SI		Translation3d_ToTranslation2d.vi						Х
		X	X	X	SI		Translation3d_UnaryMinus.vi						Х
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	TWICE	2D X		X ≥	SI	<u> </u>	Twist2d Create.vi	twist new(x, y, theta)	Notes			Щ	v
	TWIST	X		$\frac{\hat{x}}{x}$			Twist2d_Create.vi	boolean equals(obj other)					X X
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	TWIST	73D X	X	X		Χ	Twist3d_Create.vi						X
		X	X	X	SI	X	Twist3d_Equals.VI						Х
		X	XX	$(\mid X \mid$	SI	X	Twist3d_GetAll.VI						Х
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	CHASSIS SPEE	DS X	X	X	SI		ChassisSpeeds_FromFieldRelativeChassisSpeeds.VI						х
		X		X			ChassisSpeeds_FromFieldRelativeSpeeds.VI	chassisspeeds fromFieldRelativeSpeeds(double x, double y,					х
								double angvel, rotation2d robotangle)					
		X	XX	(X	SI		ChassisSPeeds_GetXYOmega.vi						Х
		X	X	X	SI		ChassisSpeeds_New.vi	chassisspeeds new (double xvel, double yvel, double angvel)					Х
								chassisspeeds new ()	can use cluster constant				Х
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	DIFFERENTIAL DRIVE KINEMAT	ics X		X	1	X	DiffKinematics New.vi	diffDriveKine new(double trackWidth)					х
		X	X	X		X	DiffKinematics toChassisSpeed.vi	chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds)					X
			X	X			DiffKinematics_ToTwist2d.vi						Х
		X	X	X		X	DiffKinematics_toWheelSpeed.vi	diffDriveWheelSpeed toWheelSpeeds(chassisSpeeds)					X
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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 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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FRC_LabVIEW_Trajectory_Library_Routines.xlsx

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>ν</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					SwerveKinematics_NormalizeWheelSpeeds.vi	public static void normalizeWheelSpeeds(SwerveModuleState[] moduleStates, double attainableMaxSpeedMetersPerSecond)				
X	()	X	X				SwerveKinematics_ToChassisSpeeds4.VI	,	For 4 module drives			
		X X					SwerveKinematics_ToChassisSpeedsX.VI	LE O. M. L. O. L. F.	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	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 array and "4" calls)			
									Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle,	variable parameters (replace with			
l					~				SwerveModuleState moduleStates)	array and "4" calls)			
		7		Menu Item	Execution Optimized	Test Routine		VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
WERVE DRIVE MODULE POSITIONS					SI			SwerveModulePosition_CompareTo.vi					
	X .				SI			SwerveModulePosition_Equals.vi					
	X	X		Χ	SI			SwerveModulePosition_Get.vi					
	X	X		Χ	SI			SwerveModulePosition_New.vi					
					<i>q</i>								
	plemented	Documented	Vot WPILIB	Menu Item	Execution Optimize	Test Routine	Sample Program				Code Review	sst Program	ror Checking
r			_			_₩_		VI Name		Notes	ŭ	4	<u>ii</u>
SWERVE DRIVE MODULE STATE	X .	X		Χ	SI			SwerveModuleState_CompareTo.vi	public int compareTo(SwerveModuleState o)				
	X	X			SI			SwerveModuleState_Equal.vi					
	X .	<i>X</i>		X	SI			SwerveModuleState_Get.vi					
	X	V		~	<u> </u>			SwerveModuleState_New.vi	public SwerveModuleState(double speedMetersPerSecond,				
		⊼		X	SI				public ower velvioudicotate (double speculvictors) croccoria,	1			
					SI				Rotation2d angle)				
	X			X				SwerveModuleState_Optimize.vi	Public SwerveModuleState (double specialisters electeria, Rotation2d angle) public SwerveModuleState optimize(SwerveModuleState desired, Rotation2d angle)				
CUBIC HERMITE SPLINE	X X X	X Documented	Not WPILIB	X X		Test Routine	Sample Program		Rotation2d angle) public SwerveModuleState optimize(SwerveModuleState desired,	Notes not needed, use cluster unpack	Code Review	Test Program	Error Checking
CUBIC HERMITE SPLINE	Implemented X X X Implemented X	X X Documented	Not WPILIB Not WPILIB	Menu Item X X X Menu Item X	ution Optimized		Sample Program Sample Program	VI Name CubicHermiteSpline_getControlVectorFromArrays.vi CubicHermiteSpline_makeHermiteBasis.vi	Rotation2d angle) 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	Code Review Code Review	<u>a</u>	Error Checking

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

	Test Program	Error Checking
	Test Program	rror Checking
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	t Program	ır Checking
	Test	≡rro
-		
	Test Program	Error Checking
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Way year and		Test Program

<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 X X 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	Χ	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
					eq				
					imized	am			
	pə,	pə.	В	_	o g				
	nplemented	Documentea	Vot WPILIB	ltem	Execution Op	e 6			
	pler	can	<i>5</i>	Menu	Execu	Sample			
	_=		_≥		<u> </u>	, <u>8</u>		Function Prototype	Notes
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 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 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 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 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 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		
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	Implementec	Documented	Vot WPILIB	Menu Item	Execution	Test Routine	Sample Program			
			8_		<u>~×</u>		Sa	VI Name	Function Prototype	Notes
MECANUM DRIVE KINEMATICS CONSTRAINT			—	X		+		MecaDriveKinematicsConstraint_getMaxVelocity.vi		
	X	X	\vdash	X	SI	+-		MecaDriveKinematicsConstraint_getMinMaxAccel.vi MecaDriveKinematicsConstraint_New.vi		
		1 - 1								ı
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					timi		Program			
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	mplementec	Documented	WPILIB	Menu Item	Execution	Test Routine	e G			
	oler	cnu	\$	п	noe	st F	Sample			
	_		Not		~		Sa	VI Name	Function Prototype	Notes
RECTANGULAR REGION CONSTRAINT			—	X			_	RectRegionConstraint_getRectRegion.vi		
	X	X	_	X		_	+	RectRegionConstraint_getMinMaxAccel.vi RectRegionConstraint_IsPoseInRegion.vi		
	X	X	\vdash	X		_		RectRegionConstraint_Isi oseiin tegion.vi		
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	Implementea	ited	IB	2	Ŏ	Test Routine	rog			
	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
				X			æ	SwerveDriveKinematicsConstraint_New.vi	Newpublic SwerveDriveKinematicsConstraint(final SwerveDriveKinematics kinematics, double	Can use cluster pack for now
	X	X		X			yram	SwerveDriveKinematicsConstraint_New.vi	Newpublic SwerveDriveKinematicsConstraint(final SwerveDriveKinematics kinematics, double	Can use cluster pack for now
	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)	

'===== 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		

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 Optimized	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		Χ	SI			Units_FeetToMeters.vi		
	Χ	Χ		Χ	SI			Units_InchesToMeters.vi		
	Χ	Χ		Χ	SI			Units_MetersToFeet.vi		
	Χ	Χ		Χ	SI			Units_MetersToInches.vi		
	Χ	Χ		X	SI			Units_MillisecondsToSeconds.vi		
	Χ	X		X	SI			Units_RadiansPerSecondToRotationsPerMinute.vi		
	Χ	X		X	SI			Units_RadiansToDegrees.vi		
	Χ	Χ		X	SI			Units_RadiansToRotations.vi		
	Χ	X		X	SI			Units_RotationsPerMinuteToRadiansPerSecond.vi		
	Χ	X		X	SI			Units_RotationsToDegrees.vi		
	Χ	X		X	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 SPACE MODEL

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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DC MOTOR	Χ	X		X	SI			DCMotor_GetAndymark9015.vi					
	Χ	X		Х	SI			DCMotor_GetAndymarkAM2235A.vi					
	Χ	X		X	SI			DCMotor GetAndymarkAM3493.vi					
	Χ	X		Х	SI			DCMotor_GetAndymarkRs775_125.vi					
	Χ	X		Χ	SI			DCMotor_GetBag.vi					

X	X	X SI	DCMotor_GetBanebotsRs550.vi
X	X	X SI	DCMotor_GetBanebotsRs775.vi
X	X	X SI	DCMotor_GetCIM.vi
X	X	X SI	DCMotor_GetCurrent.vi
X	X	X SI	DCMotor_GetFalcon500.vi
X	X	X SI	DCMotor_GetMiniCIM.vi
X	X	X SI	DCMotor_GetNEO.vi
X	X	X SI	DCMotor_GetNEO550.vi
X	X	X SI	DCMotor_GetRomiBuiltIn.vi
X	X	X SI	DCMotor_GetSpeed.vi
X	Χ	X SI	DCMotor_GetTorque.vi
X	X	X SI	DCMotor_GetVex775Pro.vi
X	X	X SI	DCMotor_New.vi
X	X	X SI	DCMotor_PickMotor.vi
X	X	X SI	DCMotor_WithReduction.vi

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

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program		Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE POSE ESTIMATOR	Χ	Χ		Χ				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					
	Χ	Χ		X				DiffDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi					

Function Prototype Notes DiffDrivePoseEst2_AddVisionMeasurement.vi
DiffDrivePoseEst2_BufferDuration.vi
DiffDrivePoseEst2_GetEstimatedPosition.vi
DiffDrivePoseEst2_InterpRecord_ExtractFromVar.vi

4 2/11/2023 – Added new pose est2		$\overline{}$								
		Χ		No			DiffDrivePoseEst2_InterpRecord_Interp.vi			
	X	Χ		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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EXTENDED KALMAN FILTER	R X	X		X			ExtendedKalmanFilter Correct OnlyUY.vi	\neg		
EXTENSES NACINANTIETE	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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KALMAN FILTER LATENCY COMPENSATOR	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	Not WPILIB	X Menu Item X X X X X X X X X X X X X X X X X X X	X X X	pple Program	KalmanFilter_GetK KalmanFilter_GetK Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_Pevoit.vi KalmanFilter_Predict.vi KalmanFilter_Reset.vi KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat_Single VI Name Function Prototype Notes KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.vi KalmanFilterLatencyComp_FindClosestMeasurement.vi	8	Test Program	Error Checking
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MECANUM DRIVE POSE ESTIMATOR				\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \			MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi					
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	X	X		X			MecaDrivePoseEst_GetEstimatedPosition.vi					
	X			No			MecaDrivePoseEst_Kalman_F_Callback.vi					
	X	X		No			MecaDrivePoseEst_Kalman_H_Callback.vi					
	Χ			Χ			MecaDrivePoseEst_New.vi					
	X			Χ			MecaDrivePoseEst_ResetPosition.vi					
	Χ			Χ			MecaDrivePoseEst_SetVisionMeasurementStdDevs.vi					
	Χ			Χ			MecaDrivePoseEst_Update.vi					
	X			X			MecaDrivePoseEst_UpdateWithTime.vi					
	Χ			No			MecaDrivePoseEst_VisionCorrect_Callback.vi					
	Χ	X		No			MecaDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi					
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SWERVE DRIVE POSE ESTIMATOR					~		SwerveDrivePoseEst AddVisionMeasurement StdDev.vi	/۴*				7
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	X	7		\overline{X}	~		SwerveDrivePoseEst2 AddVisionMeasurement.vi					
SWERVE DRIVE POSE ESTIMATOR 2	X		X		SI		SwerveDrivePoseEst2 BufferDuration.vi					
SWERVE DRIVE POSE ESTIMATOR 2				X	٠.		SwerveDrivePoseEst2 GetEstimatedPosition.vi					
SWERVE DRIVE POSE ESTIMATOR 2							SwerveDrivePoseEst2_InterpRecord_ExtractFromVar.vi					
SWERVE DRIVE POSE ESTIMATOR 2	Χ		V				SwerveDrivePoseEst2_InterpRecord_Interp.vi					
SWERVE DRIVE POSE ESTIMATOR 2	X		Χ	No				1	1	1	1	1
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SWERVE DRIVE POSE ESTIMATOR 2	X X X X			No No X			SwerveDrivePoseEst2_InterpRecord_New.vi SwerveDrivePoseEst2_New.vi					
SWERVE DRIVE POSE ESTIMATOR 2	X X X X X			No No X X			SwerveDrivePoseEst2_InterpRecord_New.vi SwerveDrivePoseEst2_New.vi SwerveDrivePoseEst2_ResetPosition.vi					
SWERVE DRIVE POSE ESTIMATOR 2	X X X X X X			No No X X			SwerveDrivePoseEst2_InterpRecord_New.vi SwerveDrivePoseEst2_New.vi SwerveDrivePoseEst2_ResetPosition.vi SwerveDrivePoseEst2_SetVisionMeasurementStdDevs.vi					
SWERVE DRIVE POSE ESTIMATOR 2	X X X X X X X			No No X X X X X			SwerveDrivePoseEst2_InterpRecord_New.vi SwerveDrivePoseEst2_New.vi SwerveDrivePoseEst2_ResetPosition.vi SwerveDrivePoseEst2_SetVisionMeasurementStdDevs.vi SwerveDrivePoseEst2_Update.vi					
SWERVE DRIVE POSE ESTIMATOR 2	X X X X X X			No No X X			SwerveDrivePoseEst2_InterpRecord_New.vi SwerveDrivePoseEst2_New.vi SwerveDrivePoseEst2_ResetPosition.vi SwerveDrivePoseEst2_SetVisionMeasurementStdDevs.vi					

3.04 2/11/2023 – Added new pose est2											
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		X	X			UnscentedKalmanFilter_Reset.vi					
	X	X	X			UnscentedKalmanFilter_SetP.vi					
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	X	X	X	(LinearPIntInvFF_New_Plant.vi				
		X	X			LinearPIntInvFF_New.vi				
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		X	X			LinearQuadraticRegulator_GetR_Single.vi				
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		X	X			LinearQuadraticRegulator_GetU.vi				
	Χ	X	X		Х	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				
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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 X 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 X 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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							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					
	X			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					
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-	X	X						DiffDriveTrainSim_ToughBoxMiniGearRatio.vi					
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	$\frac{1}{2}$	X		X		_		ElevatorSim GetVelocityMetersPerSecond.vi			-		
	$\hat{}$	$\frac{\lambda}{X}$		$\frac{\lambda}{X}$				ElevatorSim_HasHitLowerLimit.vi					
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			+		+		1	ElevatorSim_New_LinSys_NoNoise.vi					
		-	-		1		1	ElevatorSim_New_LinSys.vi					
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			χ				1	ElevatorSim_RKF45_Func.vi					
	Χ	X		X			1	ElevatorSim_SetInputVoltage.vi					
	Χ			X				ElevatorSim_SetState.vi					
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-			_	-			1			extend.			
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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					
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	X	X		X			LinearSystemSim_GetOutput.vi					
	Χ	Χ		X			LinearSystemSim_New					
							LinearSystemSim_New_NoNoise.vi					
	X			X			LinearSystemSim_SetInput_Array.vi		Doesn't use clamp ?			
	X	X	_	X			LinearSystemSim_SetInput_Single.vi					
	X	X		X			LinearSystemSim_SetInput.vi					
	X			X			LinearSystemSim_Setstate.vi					
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	X						SngJntArmSim_GetAnglerAds.vi SngJntArmSim_GetCurrentDraw.vi			+		
	X	X		X						+		
				X			SngJntArmSim_GetVelocityRadsPerSec.vi					
	X			X			SngJntArmSim_HasHitLowerLimit.vi			+		
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	X			X			SngJntArmSim_New.vi					
	Χ			No			SngJntArmSim_Rkf45_Func.vi					
		X		X			SngJntArmSim_SetInputVoltage.vi					
	X			X			SngJntArmSim_SetState.vi					
	X			X			SngJntArmSim_Update.vi					
	Χ			X			SngJntArmSim_UpdateX.vi					
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'======== MATRIX UTILITIES

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine			ction Prototype	Notes	Code Review	Test Program	Error Checking
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X	X			SI			Matrix_Transpose.vi					
X	X	X	X				Matrix_WithinTolerance.vi					
	X	X	X	X				Function	Page Page	Page	Part	Part

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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

AngleStats_AngleAdd.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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'======== 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 '========

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	Z	Z	X	X	N/A			DIFF_DRIVE_Pose_EST.ctl		
	Ζ		Χ	Χ	N/A			DIFF_DRIVE_POSE_EST2.ctl		
	Z	_	X	No	N/A			DIFF_DRIVE_POSE_EST2_INTERP_RECORD.CTL		
	Z	Z Z	X	X	N/A N/A			DIFF_DRIVE_ToughBoxMini_GearChoice_ENUM.ctl DIFF_DRIVE_ToughBoxMini_MotorChoice_ENUM.ctl		
	Z	Z	X	X	N/A			DIFF DRIVE TRAIN SIM STATE ENUM.CTL		
	Ζ	Z	X	Χ	N/A			DIFF_DRIVE_TRAIN_SIM.ctl		
	Z	Z	X	X	NA			DISPLAY_WAYPOINT.ctl		Was UTIL_WAYPOINT.VI
	Ζ	Ζ	X	X	NA			DISPLAY_WEIGHTED_WAYPOINT.ctl		New V1.5. was UTIL_WEIGHTED_WAYPOINIT.VI
	Z	Z	X	X	N/A			ELEV_FF.CTL		
	Z	Z	X	X	N/A N/A			ELEVATOR_SIM.CTL EXTENDED KALMAN CORRECT FUNC GROUP.CTL		
	Z		X	X	N/A			EXTENDED KALMAN FILTER.CTL		
	Z	Z	Χ	Χ	N/A			FLYWHEEL_SIM.ctl		
	Ζ		Χ					FUNCTION_GENERATOR_MATRIX.ctl		
	Z	Z	X	X				FUNCTION_GENERATOR.ctl		New 1/26/21
	Z	Z Z	X	X	N/A N/A			HOLONOMIC_DRV_CTRL.CTL KALMAN FILTER LATENCY COMP FUNC GROUP.CTL		IAEM I/CO/CI
	Z	Z	X	Χ	N/A			KALMAN_FILTER_LATENCY_COMP.CTL		
	Ζ	Ζ	Χ	Χ	N/A			KALMAN_FILTER.ctl		
	Z	Z	X	X				LINEAR_FILTER.CTL		
	Z	Z Z	X	X				LINEAR_PLANT_INV_FF.ctl LINEAR_QUADRATIC_REGULATOR.ctl		
	Z	Z	X	X				LINEAR SYSTEM LOOP.ctl		
	Ζ	Ζ	X	Χ	N/A			LINEAR_SYSTEM_SIM.ctl		
	Z	Z	X	X	N/A			LINEAR_SYSTEM.ctl		
	Z	Z	X	X	N/A N/A			LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl LTV_DIFF_DRIVE_CTRL.ctl		
	N/A		N/A	^	N/A			LTV UNICYCLE CONTROLLER INPUT ENUM.ctl		OBSOLETE - Removed
	Z	Z	Χ	Х	N/A			LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl		
	Z	Z	X	X				LTV_UNICYCLE_CONTROLLER.CTL		
	Z	<i>Z</i>	X	X				MECA_DRIVE_KINEMATICS.CTL MECA_DRIVE_ODOMETRY.CTL		
	Z	Z Z	X	X	N/A N/A			MECA DRIVE POSE EST.CTL		
	Z	Z	X	Χ	N/A			MECA_WHEEL_POSITIONS.CTL		
	Ζ	Ζ	Χ	Χ	N/A			MECA_WHEEL_SPEEDS.CTL		
	Z	Z						MEDIAN_FILTER.CTL		
Į	Ζ	Z	X	_ X	N/A			MERWE_SCALED_SIGMA_PTS.ctl		

Z	Ζ	X	Χ	N/A	OBSERVER SNAP LIST ITEM.CTL	
Z	Ζ	X	Χ	N/A	OBSERVER SNAPSHOT.CTL	
Z	Ζ	Х		N/A	PARAM STACK ITEM.CTL	
Z	Z	X	X	N/A	PARAM STACK.CTL	
Z	Z	X	X	N/A	PID ADV LIMITS.CTL	
Z	Z	X	X	N/A	PID ADV TUNING.CTL	
Z	Z	X		N/A	PID CONTROLLER.CTL	
Z	Z	X	X	N/A	PID ERROR TOLERANCE.CTL	
Z	Z	X	X	N/A	PID_INPUT_LIMITS.CTL	
_ <u>Z</u>	<u> </u>	X	X	N/A	PID_TUNING.CTL	
Z	Z	X	X	N/A	POSE2D.CTL	
Z	Z	X		N/A	POSE3D.CTL	
Z	Ζ	X	Χ	N/A	POSEwCURVATURE.CTL POSEwCURVATURE.CTL	
Z	Ζ	X	Χ	N/A	PROFILED_PID_CONTROLLER.CTL	
Z	Z	Χ		N/A	QUATERNION.CTL	
Z	Ζ	X	Χ	N/A	RAMSETE_EXE_TUNING.CTL	
Ζ	Ζ	X	Χ	N/A	RAMSETE.CTL	
Z	Z	X	X	N/A	ROTATION2D.CTL	
Ζ	Ζ	Χ	X	N/A	ROTATION3D.CTL	
Z	Ζ	Χ		N/A	SIMPLE_MOTOR_FF_KA_TUNE_PARAMS.CTL	
Z	Ζ	Х	Χ	N/A	SIMPLE MOTOR FF.CTL	
Z	Ζ	Х	Χ	N/A	SINGLE JOINT ARM SIM.CTL	
Z	Z	X	X	N/A	SLEW RATE LIMITER.CTL	
Z	Z	X	X	N/A	SPLINE CTRL VECTOR.CTL	
Z	Z	X		N/A	SPLINE_CTL SPLINE	
Z	Z	X	X	N/A	SWERVE DRIVE KINEMATICS.CTL	
Z	Z	X	X	N/A	SWERVE DRIVE MODULE POSITION.CTL	
Z	Z	X	X	N/A	SWERVE_DRIVE_MODULE_T-CSTHOR.CTE SWERVE DRIVE MODULE STATE.CTL	
Z	Z	X	X	N/A	SWERVE_DRIVE_MODULE_STATE.CTL SWERVE DRIVE ODOMETRY.CTL	
Z	Z	X		N/A	SWERVE_DRIVE_OBOMETRY.CTE SWERVE DRIVE Pose EST.CTL	
Z		X	X	N/A	SWERVE_DRIVE_10SE_EST.crt	
Z		X		N/A	SWERVE_DRIVE_POSE_EST2_INTERP_RECORD.CTL	
	7			N/A	TIME INTERPOLATABLE BOOLEAN.CTL	
Z	Z	X	X			
	Z	X	X	N/A	TIME_INTERPOLATABLE_DOUBLE.CTL	
Z	Z	X		N/A	TIME_INTERPOLATABLE_POSE2D.CTL	
Z	Z	X	Χ	N/A	TIME_INTERPOLATABLE_ROTATION2D.CTL	
Z	Z	X	V	N/A	TIME_INTERPOLATABLE_VARIANT.CTL TIMER.CTL	
Z	Z	X	X	N/A		
Z	Z	X		N/A	TRAJ_CONFIG.CTL	
Z	Z	X	X	N/A	TRAJ_CONSTRAINT_CENTRIPETAL_ACCEL.CTL	
Z	Z	X	X	N/A	TRAJ_CONSTRAINT_DIIF_DRIVE_KINEMATICS.CTL	
Z	Z	X	X	N/A	TRAJ_CONSTRAINT_DIIF_DRIVE_VOLTAGE.CTL	
Z	Ζ	X	Χ	N/A	TRAJ_CONSTRAINT_ELLIP_REGION.CTL	B ::
1	_	X		N/A	TRAJ_CONSTRAINT_JERK.CTL	Routine exists, it is just a shell
Z	Z	X		N/A	TRAJ_CONSTRAINT_MAX_VELOCITY.CTL	
Z				N/A	TRAJ_CONSTRAINT_MECA_DRIVE_KINEMATICS.CTL	
_ <u>Z</u>	Z	X		N/A	TRAJ_CONSTRAINT_MINMAX.CTL	
Z	<u>Z</u>	X		N/A	TRAJ_CONSTRAINT_RECT_REGION.CTL	
Z	<u>Z</u>	X		N/A	TRAJ_CONSTRAINT_SWERVE_DRIVE_KINEMATICS.CTL	
Z	<u>Z</u>	X		N/A	TRAJ_STATE.CTL	
Z	Z	X	X	N/A	TRAJECTORY_SPLINE_TYPE_ENUM.CTL	
Ζ	Ζ	Χ		N/A	TRAJECTORY.CTL	
Z	Ζ	Χ	Χ	N/A	TRANSFORM2D.CTL	
Ζ	Ζ	Χ		N/A	TRANSFORM3D.CTL	
Ζ	Ζ	Χ	Χ	N/A	TRANSLATION2D.CTL	
Ζ	Ζ	Χ	Χ	N/A	TRANSLATION3D.CTL	
Ζ	Ζ	Χ		N/A	TRAPEZOID_PROFILE_CONSTRAINT.CTL	
Z	Ζ	Χ	X	N/A	TRAPEZOID_PROFILE_STATE.CTL	
Z	Ζ	Χ	Χ	N/A	TRAPEZOID_PROFILE.CTL	
Z	Ζ	Х	Χ	N/A	TWIST2D.CTL	
	Ζ	Х	Χ	N/A	TWIST3D.CTL	
Z				N/A	UNSCENTED KALMAN CORRECT FUNC GROUP.CTL	
	Z			N/A	UNSCENTED KALMAN FILTER.ctl	
Z Z Z		X	X			
Ζ	Ζ		X	N/A	UNSCENTED KALMAN NEW FUNC GROUP.CTL	
Z	Z Z	X		N/A		
Z Z Z Z Z	Z Z Z	X X X	Χ		UTIL_PATHFINDER_CONFIG.CTL	Delete – obsolete
Z Z Z	Z Z Z	X X X N/A	X	N/A	UTIL_PATHFINDER_CONFIG.CTL WAYPOINTS.CTL	Delete – obsolete New V1.5
Z Z Z Z N/A	Z Z Z Z	X X X	Χ	N/A N/A	UTIL_PATHFINDER_CONFIG.CTL	
Z Z Z Z N/A Z	Z Z Z Z	X X X N/A X	X X X	N/A	UTIL_PATHFINDER_CONFIG.CTL WAYPOINTS.CTL WEIGHTED_WAYPOINT.CTL	New V1.5

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