Revision 2.X 11/12/2021 – State Space Items – (This list is still missing one VI....) Added additional columns for test and sample.

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 88.35% Optimization Pct 40.97%

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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	Implemented	Documented	Not WPILIB	tem.	Execution Optimized	Test Routine	Sample Program			
	plen	unoc	ot WF	Menu Item	ecut	st R	эшрі			
	Ε.	Ğ	ž	Ž			လိ	VI Name	Function Prototype	Notes
LINEAR FILTER		X		X	SI			LinearFilter_Calculate.vi		
	X	X	X	X	X			LinearFilter_CutoffFrequency.vi		
	X	X	Χ		1		Χ	LinearFilter_Execute.vi		Labview style helper
-	X	X		X	X			LinearFilter_HighPass.vi		
-	X	X	X	X	X			LinearFilter_HighPassBW1.vi		
-		X	<u>X</u>	X	X			LinearFilter_HighPassBW2.vi		
-	X	X	X	X	X			LinearFilter_LowPassBW1.vi LinearFilter_LowPassBW2.vi		
-	X	X	Λ_	X						
-	X	X		X	X			LinearFilter_MovingAverage.vi LinearFilter New.vi		
-	X	X		X	SI			LinearFilter_New.vi		
-	X	X	X	X	SI			LinearFilter ResetToValue.vi		
-	X	\hat{X}		X	X			LinearFilter_SinglePoleIIR.vi		
-	X	\hat{X}	Χ	X	$\frac{\wedge}{X}$			LinearFilter TimeConst.vi		
L	^	^	^	_ ^	^			Linear-iitei_TimeConst.vi		
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
MEDIAN FILTER		X		X	X		_	MedianFilter Calculate.vi	7.	
	X	X	X		1		Χ	MedianFilter_Execute.vi		Labview style helper
Ţ	X	X		Х	SI			MedianFilter_New.vi		
	Χ	Χ		X	SI			MedianFilter_Reset.vi		
	X	X	Χ	Χ				MedianFilter_ResetToValue.vi		

Revision 2.X	11/12/2021 – State Space Items – (This list is still missing one VI) Added additional columns for test and sample.
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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimize	Test Routine	Sample Program	VI Name	Function Prototype	Notes
SLEW RATE FILTER	X	X		X	1			SlewRateLimiter_Calculate.vi		
	X	X	X	X	SI			SlewRateLimiter_Close.vi		
	X	X	X	X	1		X	SlewRateLimiter_Execute.vi		Labview style helper
	X	X	X	X	SI			SlewRateLimiter_GetRate.vi		
	X	X		X	1			SlewRateLimiter_New.vi		
	X	X		X	1			SlewRateLimiter_NewInitialZero.vi		
	X	X		X	1			SlewRateLimiter_Reset.vi		
	X	X		X	SI			SlewRateLimiter_SetRate.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimize	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TIMER		X	Χ	X				Timer_Close.vi		releases semaphore
	Χ	X		X			Χ	Timer_Get.vi		
	Χ	X	X	X				Timer_GetAndReset.vi		
	Χ	X	X	No				Timer_GetInternal.vi		Internal (private) only
	X	X		X			X	Timer_HasPeriodPassed.vi		
	X	X	X	X			Χ	Timer_HasPeriodPassedOnce.vi		
	Χ	X		X				Timer_New.vi		
	X	X		X			X	Timer_Reset.vi		
	X	X	X	No				Timer_ResetInternal		Internal (private) only
	Χ	X		X				Timer_Start.vi		
	X	X		X			X	Timer_Stop.vi		
	Χ	X	X	No				Timer_StopInternal.vi		Internal (private) only

'===== CONTROLLER '======

ADM CC	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
ARM FF		X		Χ				ArmFF_Calculate.vi		
	X	X		X				ArmFF_CalculateVelocityOnly.vi		
			X					ArmFF_Execute.vi		LabVIEW style single call
			X					ArmFF_ExecuteVelocityOnly.vi		LabVIEW style single call
	X	Χ		Χ				ArmFF_MaxAchieveAccel.vi		
	X	Χ		X				ArmFF_MaxAchieveVelocity.vi		
	X	Χ		X				ArmFF_MinAchieveAccel.vi		
	X	Χ		X				ArmFF_MinAchieveVelocity.vi		
	X	X		X				ArmFF_New.vi		
	X	X		X				ArmFF New ZeroGravitv.vi		

ibrary – VI Implementatio	n Lis	st						_	
te Space Items – (This list is	still m	nissin	g one	VI)) Added ا	additi	ional columns for test and sample.		
					mize	8	•		
	þ	þ	m		Optimiz	Sample Program			
	Implementea	Documented	Not WPILIB	em	Execution Op Test Routine	Pro			
	lem	ŭn	Ŋ	Menu Item	Execution Test Routi	e/ac			
	dul	000	Not	Mer	Exe	San	VI Name	Function Prototype	Notes
CONTROLLER UTIL	. X			X	SI	Τ.	ControllerUtil_GetModulusError.vi	71	This was short lived in WPILIB, but
									still useful here.
					þ				
					Execution Optimizea Test Routine	8			
	þ	g	~)pti	Sample Program			
	Implementea	Documented	Not WPILIB	Menu Item	Execution Op Test Routine	Ą	-		
	lem,	ŭ	Μ	iu It	cutii t Ro	e/ac			
	ďш,	ဝို	Vot	Mer	Exe	San	VI Name	Function Prototype	Notes
ELEV FF	X	X		X			ElevFF_Calculate.vi	71	
	X	Χ	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	X			ElevFF_CalculateVelocityOnly.vi		Lab VIETAV at da air ala anti
			X			+	ElevFF_Execute.vi ElevFF ExecuteVelocityOnly.vi		LabVIEW style single call LabVIEW style single call
	X	X	^	X			ElevFF MaxAchieveAccel.vi		East IEW Style Single Sail
	Χ			X			ElevFF_MaxAchieveVelocity.vi		
	X	X		X			ElevFF_MinAchieveAccel.vi ElevFF_MinAchieveVelocity.vi		
	X	X		X			ElevFF New.vi		
	X	X		X			ElevFF_New_ZeroAccel.vi		
					ď				
					iize	_			
	7	~			Optimiz ine	rar			
	nte	ntec	riB	Ë	n O Itine	Pro			
	эше	ıme	Μ	ı Ite	utio	a/e			
	Implemented	Documented	Not WPILIB	Menu Item	Execution Op Test Routine	Sample Program	VI Name	Function Prototype	Notes
HOL_DRV_CTRL	. X	X		X	<u> </u>		HolDrvCtrl AtReference.vi	1 unction 1 rototype	Added 1/26/21
	X	X		X			HolDrvCtrl_Calculate.vi		Added 1/26/21
	X	Χ		Χ			HolDrvCtrl_Calculate_Trajectory.vi HolDrvCtrl_Execute.vi		Added 1/26/21
			X			+	HolDrvCtrl_Execute_Vi HolDrvCtrl_Execute_Trajectory.vi		Future Future
	Χ	Х		X			HolDrvCtrl_New.vi		Added 1/26/21
	X	X		X			HolDrvCtrl_SetEnabled.vi		Added 1/26/21
	X	X		X			HolDrvCtrl_SetTolerance.vi		Added 1/26/21
					pə				
					Optimize	2			
	þ	þ	~		Opti e	Program			
	ente	ente	ILIE	em		P			
	lem	ŭ	Ŋ	iu It	cuti t Ro	e/ac	2		
	Implemented	Documented	Not WPILIB	Menu Item	Execution Op Test Routine	Sample	VI Name	Function Prototype	Notes
PID CONTROLLER	X	X	X	X			PIDController_AdvCalculate_FF_Sp_Pv.vi		Advanced PID
	X	X	X	X			PIDController_AdvCalculate_FF_Sp_Pv_Per.vi		Advanced PID
	X	X	X	X		X	PIDController_AdvExecute.vi		Labview style helper. Advanced PID
	X	X		X			PIDController_AtSetpoint.vi		
	X	X		X		4	PIDController_Calculate_PV.vi		
	X	X		X		+	PIDController Calculate SP PV.vi PIDController DisableContinousInput.vi		
	$\frac{\lambda}{X}$	X		X		+	PIDController_EnableContinuousInput.vi		
	Χ	Χ	Χ	Χ		Х	PIDController_Execute.vi		Labview style helper
							PIDController GetContinuousError.vi		OBSOLETE – Removed
	~	X		Х			PIDController GetPeriod.vi		OBSOLLTE - Removed

s still m	issing	one \	VI)) Add	ed additional columns for test and sample.	
X	X		X		PIDController_GetPID.vi	
X	X		X		PIDController_GetPositionError.vi	
X	X		Χ		PIDController_GetSetpoint.vi	
X	X		Χ		PIDController_GetVelocityError.vi	
X	X		X		PIDController_IsContinuousInputEnabled.vi	
X	X		X		PIDController_New.vi	
X	Χ		X		PIDController_NewPeriod.vi	
Χ		Χ	X	SI	PIDController_Pack_AdvLimits.vi	
Χ		Χ	X	SI	PIDController_Pack_AdvTuning.vi	
X		Χ	X	SI	PIDController_Pack_ErrorTolerance.vi	
X		Χ	X	SI	PIDController_Pack_InputLimits.vi	
X		Χ	Χ	SI	PIDController_Pack_Tuning.vi	
X	X		Χ		PIDController_Reset.vi	
X	Χ		X		PIDController_SetD.vi	
X	X	X	Χ		PIDController_SetDerivativeFilter.vi	Advanced PID
X	X	X	No		PIDController_SetFeedForward.vi	Advanced PID, Obsolete –
						DELETE
X	X	X	No		PIDController_SetFFGain.vi	Advanced PID, Obsolete – DELETE
X	X		Х		PIDController Setl.vi	<u> </u>
					PIDController SetInputRange.vi	OBSOLETE – Removed
Х	Х		Х		PIDController_SetIntegratorRange.vi	OBOCETE TROMOVED
X	X	X	X		PIDController_SetOutputLimits.vi	Advanced PID
X	X		X		PIDController SetP.vi	/ tavarious i ib
X	X	X	X		PIDController SetPeriod.vi	
X	X		X		PIDController SetPID.vi	
X	X	X	X		PIDController SetPIDF.vi	Advanced PID
X	X		X		PIDController_SetSetpoint.vi	, availou i ib
X	X		X		PIDController SetTolerance.vi	
X	X		X		PIDController SetTolerancePandV.vi	
					IDOOHIONG_Octrolerancer and v. vi	

PROFILED PID CONTROLLER		Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name Function Prototype	Notes
X	PROFILED PID CONTROLLER	X	Χ		Χ				ProfiledPIDController_AtGoal.vi	
X										
X X X ProfiledPIDController_Calculate_Meas_StateGoal.vi X X X ProfiledPIDController_DisableController_										
X										
X X X ProfiledPIDController_DisableContInput.vi X X X X ProfiledPIDController_EnableContInput.vi X X X X ProfiledPIDController_GetGoal vi X X X X ProfiledPIDController_GetPeriod.vi X X X X ProfiledPIDController_GetPeriod.vi X X X X ProfiledPIDController_GetPoint.vi X X X X ProfiledPIDController_GetVelocityError.vi X X X X ProfiledPIDController_GetVelocityError.vi X X X X ProfiledPIDController_New.vi X X X X ProfiledPIDController_Reset.vi X X X X ProfiledPIDController_Reset.vi X X X X ProfiledPIDController_Reset.poonly.vi X X X X ProfiledPIDController_Reset.poonly.vi X X X X ProfiledPIDController_Reset.poonly.vi X X X X ProfiledPIDController_SetConstraints.vi X X X X ProfiledPIDController_SetGoal.vi X X X ProfiledPIDController_SetGoal.vi X X X ProfiledPIDController_SetGoal.vi X X X ProfiledPIDController_SetGoal.vi X X X ProfiledPIDController_SetGoal.posOnly.vi X X X ProfiledPIDController_SetGoal.posOnly.vi X X X ProfiledPIDController_SetGoal.posOnly.vi X X X ProfiledPIDController_SetGoal.posOnly.vi										
X X X X ProfiledPIDController_GetGoal.vi X X X X ProfiledPIDController_GetPeriod.vi X X X X ProfiledPIDController_GetSetpoint.vi X X X X ProfiledPIDController_GetVelocityError.vi X X X X ProfiledPIDController_New vi X X X X ProfiledPIDController_New Vi X X X X ProfiledPIDController_Reset.vi X X X X ProfiledPIDController_Reset.posOnly.vi X X X X ProfiledPIDController_Reset_PosOnly.vi X X X X ProfiledPIDController_SetCoal.vi X X X X ProfiledPIDController_SetGoal.vi		-								
X X X X ProfiledPIDController GetGoal.vi X X X X ProfiledPIDController GetPiD.vi X X X X ProfiledPIDController GetPiD.vi X X X X ProfiledPIDController GetPiD.vi X X X X ProfiledPIDController GetPositionError.vi X X X X ProfiledPIDController GetSetpoint.vi X X X X ProfiledPIDController GetVelocityError.vi X X X X ProfiledPIDController GetVelocityError.vi X X X X ProfiledPIDController New.vi X X X X ProfiledPIDController NewPeriod.vi X X X X ProfiledPIDController Reset.vi X X X X ProfiledPIDController Reset.vi X X X X ProfiledPIDController Reset.vi X X X X ProfiledPIDController Reset.posVel.vi X X X X ProfiledPIDController Reset PosConly.vi X X X X ProfiledPIDController Reset PosConly.vi X X X X ProfiledPIDController SetConstraints.vi X X X X ProfiledPIDController SetGoal.vi X X X X ProfiledPIDController SetGoal.vi X X X ProfiledPIDController SetGoal PosConly.vi X X X ProfiledPIDController SetGoal PosConly.vi X X X ProfiledPIDController SetGoal PosConly.vi										
X Y Y ProfiledPIDController GetSetpoint.vi X X X X X X ProfiledPIDController GetVelocityError.vi X X X X X Y ProfiledPIDController New.vi Y Y Y Y Y Y ProfiledPIDController New.vi Y Y Y Y Y Y ProfiledPIDController New.vi Y Y Y Y Y ProfiledPIDController New.vi Y Y Y Y Y ProfiledPIDController New.vi Y Y Y Y Y Y ProfiledPIDController Reset PosOnly.vi Y Y Y Y Y ProfiledPIDController SetConstraints.vi Y Y Y Y ProfiledPIDController SetGoal.vi Y Y Y Y ProfiledPIDController SetIntegratorRange.vi Y Y Y Y										
X X X X WPILIB has separate getters. X X X X X WPILIB has separate getters. X X X X X ProfiledPIDController GetSetpoint.vi X X X X ProfiledPIDController GetVelocityError.vi X X X X ProfiledPIDController New.vi X X X ProfiledPIDController New.vi X X X ProfiledPIDController Reset.vi X X X ProfiledPIDController Reset.posOnly.vi X X X ProfiledPIDController Reset.posVel.vi X X X ProfiledPIDController SetConstraints.vi X X X ProfiledPIDController SetGoal.vi X X X ProfiledPIDController SetGoal.PosOnly.vi X X X ProfiledPIDController SetGoal.PosOnly.vi										
X X X ProfiledPIDController_GetSetpoint.vi X X X X ProfiledPIDController_GetVelocityError.vi X X X X ProfiledPIDController_New.vi X X X ProfiledPIDController_NewPeriod.vi X X X ProfiledPIDController_Reset.vi X X X ProfiledPIDController_Reset_PosOnly.vi X X X ProfiledPIDController_Reset_PosVel.vi X X X ProfiledPIDController_SetGoal.vi X X X ProfiledPIDController_SetGoal.vi X X X ProfiledPIDController_SetGoal.posOnly.vi X X X ProfiledPIDController_SetGoal.posOnly.vi X X X X ProfiledPIDController_SetGoal.posOnly.vi										
X X X ProfiledPIDController_GetSetpoint.vi X X X X ProfiledPIDController_New.vi X X X X ProfiledPIDController_NewPeriod.vi X X X X ProfiledPIDController_Reset.vi X X X ProfiledPIDController_Reset_PosOnly.vi X X X ProfiledPIDController_Reset_PosVel.vi X X X ProfiledPIDController_SetConstraints.vi X X X ProfiledPIDController_SetGoal.vi X X X ProfiledPIDController_SetGoal_PosOnly.vi X X X ProfiledPIDController_SetGoal_PosOnly.vi				X						WPILIB has separate getters.
X X X ProfiledPIDController GetVelocityError.vi X X X X ProfiledPIDController New.vi X X X X ProfiledPIDController Reset.vi X X X X ProfiledPIDController Reset PosOnly.vi X X X X ProfiledPIDController Reset PosVel.vi X X X ProfiledPIDController SetConstraints.vi X X X ProfiledPIDController SetGoal.vi X X X ProfiledPIDController SetGoal PosOnly.vi X X X ProfiledPIDController SetIntegratorRange.vi										
X X X ProfiledPIDController New.vi X X X X ProfiledPIDController Reset.vi X X X ProfiledPIDController Reset PosOnly.vi X X X ProfiledPIDController Reset PosVel.vi X X X ProfiledPIDController SetConstraints.vi X X X ProfiledPIDController SetGoal.vi X X X ProfiledPIDController SetGoal PosOnly.vi X X X ProfiledPIDController SetIntegratorRange.vi										
X X X ProfiledPIDController Reset.vi X X X X ProfiledPIDController Reset PosOnly.vi X X X X ProfiledPIDController Reset PosVel.vi X X X ProfiledPIDController SetConstraints.vi X X X ProfiledPIDController SetGoal.vi X X X ProfiledPIDController SetGoal PosOnly.vi X X X ProfiledPIDController SetIntegratorRange.vi										
X X X X ProfiledPIDController_Reset.vi X X X X X ProfiledPIDController_Reset_PosOnly.vi X X X X ProfiledPIDController_SetConstraints.vi X X X X ProfiledPIDController_SetGoal.vi X X X X ProfiledPIDController_SetGoal_PosOnly.vi X X X X ProfiledPIDController_SetGoal_PosOnly.vi X X X ProfiledPIDController_SetIntegratorRange.vi									_	
X X X ProfiledPIDController_Reset_PosOnly.vi X X X X ProfiledPIDController_Reset_PosVel.vi X X X X ProfiledPIDController_SetConstraints.vi X X X X ProfiledPIDController_SetGoal.vi X X X X ProfiledPIDController_SetGoal_PosOnly.vi X X X ProfiledPIDController_SetIntegratorRange.vi								_		
X X X X ProfiledPIDController_Reset_PosVel.vi X X X X X ProfiledPIDController_SetConstraints.vi X X X X ProfiledPIDController_SetGoal.vi X X X X ProfiledPIDController_SetGoal_PosOnly.vi X X X X ProfiledPIDController_SetIntegratorRange.vi										
X X X X ProfiledPIDController_SetConstraints.vi X X X X ProfiledPIDController_SetGoal.vi X X X X ProfiledPIDController_SetGoal_PosOnly.vi X X X X ProfiledPIDController_SetIntegratorRange.vi										
X X X X ProfiledPIDController_SetGoal.vi X X X X ProfiledPIDController_SetGoal_PosOnly.vi X X X X ProfiledPIDController_SetIntegratorRange.vi										
X X X X ProfiledPIDController_SetGoal_PosOnly.vi X X X X ProfiledPIDController_SetIntegratorRange.vi					~					
X X ProfiledPIDController SetIntegratorRange.vi										
		-								
X X X ProfiledPIDController_SetTolerance_PosOnly.vi										
X X X ProfiledPIDController SetTolerance PosVel.vi					X					

Revision 2.X	11/12/2021 – State	Space Items –	(This list is still missing	ng one VI) Added additional	columns for test and sample.
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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	 VI Name	Function Prototype	Notes
RAMSETE	Χ	Χ		X	SI		Ramsete_New.vi	new	
	X	X		X	SI		Ramsete_New_B_Z.vi	new(b, zeta)	
	X	X		X	X		Ramsete_Calculate.vi	calculate	
	X	Χ		X	X		Ramsete_Calculate_Trajectory.vi	calculate_trajectory	
	Χ		Χ	X			Ramsete_Execute.vi		
	Χ		Χ	Χ			Ramsete_Execute_ENG.vi	Use this one!!	
	Χ		Χ	X			Ramsete_Execute_PackTuning.vi		
	Χ		Χ	X			Ramsete_Execute_PackTuning_ENG.vi		
	Χ	Χ		Χ	SI		Ramsete_AtReference.vi	AtReference	
	Χ	Χ		X	SI		Ramsete_SetEnabled.vi	SetEnabled	
	Χ	Χ		Χ	SI		Ramsete_SetTolerance.vi	SetTolerance	
	Χ	Χ		X	X		Ramsete_SINC.vi	sinc	internal
	Χ	X	X	Χ	Χ		Ramsete_Diff_DO_Eng.vi		
	Χ	X	X	X	X		Ramsete_Diff_DO_SI.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimizea	Test Routine	Sample Program	Function Prototype	Notes
SIMPLE MOTOR FEEDFORWARD	X	Χ		Χ	SI		SimpleMotorFF_New.vi	public SimpleMotorFeedforward(double ks, double kv, double ka)	
								public SimpleMotorFeedforward(double ks, double kv)	
	X	Χ		Χ	SI		SimpleMotorFF_Calculate.vi	public double calculate(double velocity, double acceleration)	
	X			Χ			SimpleMotorFF_Calculate_NextV_Dt.vi		
	X	X		X	SI		SimpleMotorFF_CalculateVelocityOnly.vi	public double calculate(double velocity)	
			X				SimpleMotorFF_Execute.vi		LabVIEW style single call
			X				SimpleMotorFF_ExecuteVelocityOnly.vi		LabVIEW style single call
	X	X		X	X			public double maxAchievableVelocity(double maxVoltage, double acceleration)	
	X	X		X	X			public double minAchievableVelocity(double maxVoltage, double acceleration)	
	X	Χ		Χ	X			public double maxAchievableAcceleration(double maxVoltage, double velocity)	
	X	Χ		Χ	X			public double minAchievableAcceleration(double maxVoltage, double velocity)	

'===== GEOMETRY '=======

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program Manual IV	Function Prototype	Notes
POSE								pose2d new()	can use cluster constant
	Χ	Χ		Χ	SI		Pose_New_TRRO.vi	pose2d new(translation2d, rotation2d)	
	Χ	Χ		Χ	SI		Pose_New.vi	pose2d new(double x, double y, rotation2d)	
	Χ	Χ		X	SI		Pose_Plus.vi	pose2d plus(transform2d other)	
	Χ	Χ		Χ	SI		Pose_Minus.vi	transform2d minus(pose2d other)	
	Χ	X		Χ	SI		Pose_getTranslation.vi	translation2d getTranslation()	can also use cluster unpack
	Χ	Χ		Χ	SI		Pose_getRotation.vi	rotation2d getRotation()	can also use cluster unpack

Revision 2.X 11/12/2021 – State Space Items – (This list is still missing one VI) Added additional columns for test and	Revision 2.X 11/12/2021	 State Space Items – 	(This list is still missing one VI)	Added additional columns for test and sar	nple.
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. 13 31111 1	1113311	19 011	C VI.	,	/ luul	su auu	IIIOI	iai columnis for test and sample.	
X	X	´ X		X	SI			Pose_getXY.vi	
X	X	<i>X</i>		X	SI			Pose_getXYAngle.vi	
X	X		(X	SI			Pose_TransformBy.vi	pose2d transformby(transform2d other)
X	X		(X	SI			Pose_RelativeTo.vi	pose2d relativeto(pose2d other)
X	X		(X	X			Pose_Exp.vi	pose2d exp(twist2d twist)
X	X)	X	X			Pose_Log.vi	twist2d log(pose2d end)
X	X		(Χ	SI			Pose_Equals.VI	boolean equals(other obj)

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
ROTATION									rotation2d new()	can use cluster constant
	X	Χ		Χ	SI			Rotation_CreateAngle.vi	rotation2d new(double value)	
	X	Χ		X	SI			Rotation_CreateXY.vi	rotation2d new(double x, double y)	
	X	Χ		Χ	SI			Rotation_CreateAngleDegrees.vi	rotation2d fromDegrees(double degrees)	convert to radians then create
	Χ	Χ		Χ	SI			Rotation_Plus.vi	rotation2d plus(rotation2d other)	
	Χ	Χ		Χ	SI			Rotation_Minus.vi	rotation2d minus(rotation2d other)	
	Χ	Χ		Χ	SI			Rotation_UnaryMinus.vi	rotation2d unaryminus()	
	X	Χ		Χ	SI			Rotation_Times.vi	rotation2d times(double scalar)	
	X	X		X	SI			Rotation_RotateBy.vi	rotation2d rotateby(rotation2d other)	
	X	Χ	Χ	Χ	SI			Rotation_GetAngleCosSin.vi		New 1/26/21
	Χ	Χ		Χ	SI			Rotation_GetRadians.VI	double getRadians()	use cluster unpack
	X	X		X	SI				double getDegrees()	use cluster unpack, then convert to degree
	X	X		X	SI			Rotation_GetCos.VI	double getCos()	use cluster unpack
	X	Χ		Χ	SI			Rotation_GetSin.VI	double getSin()	use cluster unpack
	X	Χ		Χ	SI			Rotation_GetTan.VI	double getTan()	can calculate
	Χ	Χ		Χ	SI			Rotation_Equals.vi	boolean equals(rotation2d other)	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimize	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TRANSFORM	X	Χ		Χ	SI			Transform_Create_PosePose.vi	transform2d new(pose2d, pose2d)	
	Χ	X		Χ	SI			Transform_Create_TransRot.vi	transform2d new(translation2d, rotation2d)	
									transform2d new()	can use cluster constant
	Χ	X		Χ	SI			Transform_Times.vi	transform2d times(double scalar)	
	Χ	X		Χ	SI			Transform_GetTranslation.VI	translation2d getTranslation()	use cluster unpack
	Χ	X		Χ	SI			Transform_GetRotation.VI	rotation2d getRotation()	use cluster unpack
	Χ	X	X	Χ	SI			Transform_GetXY.vi		
	X	X	X	Χ	SI			Transform_GetXYAngle.vi		
	X	X		Χ	SI			Transform_Inverse.vi	transform inverse()	new
	X	X		Χ	SI			Transform_Equals.VI	boolean equals(other transform2d)	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Nample Program	Function Prototype	Notes
TRANSLATION								translation2d new()	can use cluster constant
	Χ	X		Χ	SI		Translation_Create.vi	translation2d new(double x, double y)	
	X	X		Χ	SI		Translation_Create_DistAng.vi		
	Χ	Χ		Χ	SI		Translation_GetDistance.vi	double getDistance(translation2d other)	
	Χ	Χ		Χ	SI		Translation_GetX.VI	double getX()	can use cluster unpack

FRC LabVIEW Trajectory Library – VI Implementation	n Lis	t						
Revision 2.X 11/12/2021 – State Space Items – (This list is s			one '				nal columns for test and sample.	
		X		X	SI		Translation_GetY.VI double getY()	can use cluster unpack
			X		SI		Translation_GetXY.VI	
	X	X			SI		Translation_GetNorm.VI double getNorm()	can use cluster unpack
	X	X			SI		Translation_RotateBy.vi translation2d rotateBy(rotation2d other)	
	X				SI		Translation_Plus.vi translation2d plus(translation2d other)	
	X	X		X	SI		Translation_Minus.vi translation2d minus(translation2d other)	
		X			SI		Translation_UnaryMinus.vi translation2d unaryminus()	
	X	Χ		Χ	SI		Translation_Times.vi translation2d times(double scalar)	
		Х		X			translation2d div(double scalar) Translation_Equals.vi boolean equals(translation other)	can multiply by 1/scalar
TWIST			Not WPILIB	X Menu Item	SI		VI Name Function Prototype Twist_Create.vi twist new(x, y, theta)	Notes
	X	X	Х		SI SI		Twist_Equals.VI boolean equals(obj other) Twist_GetAll.VI	
======== (INEMATICS =========					pə			
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CHASSIS SPEEDS			Not 1				chassisspeeds new ()	can use cluster constant
CHASSIS SPEEDS	X	X		X	SI		chassisSpeeds new () ChassisSpeeds_New.vi chassisspeeds new (double xvel, double x	can use cluster constant
CHASSIS SPEEDS	X	X	X Not 1	X	SI SI		chassisSpeeds new () ChassisSpeeds_New.vi chassisspeeds new (double xvel, double y ChassisSPeeds_GetXYOmega.vi	can use cluster constant yvel, double angvel)
CHASSIS SPEEDS	X	X		X	SI		chassisSpeeds new () ChassisSpeeds_New.vi chassisspeeds new (double xvel, double x	can use cluster constant yvel, double angvel)
CHASSIS SPEEDS	X	X		X	SI S	st Routine mple Program	chassisspeeds new () ChassisSpeeds_New.vi chassisspeeds new (double xvel, double yel, dou	can use cluster constant yvel, double angvel)
CHASSIS SPEEDS DIFFERENTIAL DRIVE KINEMATICS	X X X X X X X X X X	X X X X	X	X X X	Execution Optimized 19 19 19	Test Routine Sample Program	ChassisSpeeds_New.vi	can use cluster constant yvel, double angvel) double x, double y,
	X X X X X	X X Documented	X	X X X X	N Execution Optimized S S S	X X Test Routine Sample Program	chassisSpeeds new () ChassisSpeeds_New.vi chassisspeeds new (double xvel, double younged) ChassisSpeeds_GetXYOmega.vi chassisSpeeds fromFieldRelativeSpeeds(double angvel, rotation2d robotangle) VI Name ChassisSpeeds new (double xvel, double younged) ChassisSpeeds fromFieldRelativeSpeeds(double angvel, rotation2d robotangle)	can use cluster constant yvel, double angvel) double x, double y, Notes
	X X X X X	X X X X	X	X X X X	- Execution Optimized Signature Sign	X X Test Routine Sample Program	ChassisSpeeds_New.vi	can use cluster constant yvel, double angvel) double x, double y, Notes /heelSpeeds)
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DIFFERENTIAL DRIVE KINEMATICS	Implemented X X X X X X X X X X X X X X X X X X X	X X Documented	X	X X X X	otimized 9 X - Execution Optimized 9 9 9 9	st Routine X X X Test Routine mple Program Sample Program	chassisSpeeds new () ChassisSpeeds New.vi chassisSpeeds new (double xvel, double angvel, rotation2d robotangle) VI Name Function Prototype DiffKinematics New.vi diffDriveKine new(double trackWidth) DiffKinematics toChassisSpeed.vi chassisSpeeds (diffDrW DiffKinematics toWheelSpeed.vi diffDriveWheelSpeed toWheelSpeeds(chase) VI Name Function Prototype	can use cluster constant yvel, double angvel) double x, double y, Notes /heelSpeeds) assisSpeeds) Notes
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DIFFERENTIAL DRIVE KINEMATICS	Implemented X X X X X X X X X X X X X X X X X X X	X X Documented	X Not WPILIB	X X X X X X	otimized 9 X - Execution Optimized 9 9 9 9	Test Routine X X X Test Routine Sample Program	ChassisSpeeds New.vi chassisSpeeds new () ChassisSPeeds GetXYOmega.vi chassisSpeeds fromFieldRelativeSpeeds.VI chassisSpeeds fromFieldRelativeSpeeds() ChassisSpeeds FromFieldRelativeSpeeds.VI chassisSpeeds fromFieldRelativeSpeeds() double angvel, rotation2d robotangle) VI Name Function Prototype DiffKinematics New.vi diffDriveKine new(double trackWidth) DiffKinematics toChassisSpeed.vi chassisSpeeds toChassisSpeeds(diffDrW.) DiffKinematics toWheelSpeed.vi diffDriveWheelSpeed toWheelSpeeds(chassisSpeeds(chassisSpe	Can use cluster constant
DIFFERENTIAL DRIVE KINEMATICS	Implemented X X X X X X X X X X X X X X X X X X X	Documented X X X Documented	Not WPILIB X	Menu Item X X X Menu Item	otimized 9 X - Execution Optimized 9 9 9 9	Sample Program Sample Program	ChassisSpeeds New.vi chassisspeeds new () ChassisSPeeds GetXYOmega.vi ChassisSpeeds FromFieldRelativeSpeeds.VI chassisspeeds fromFieldRelativeSpeeds(double angvel, rotation2d robotangle) VI Name Function Prototype DiffKinematics New.vi diffDriveKine new(double trackWidth) DiffKinematics to ChassisSpeed.vi chassisSpeeds to ChassisSpeeds (diffDrW DiffKinematics to WheelSpeed.vi diffDriveWheelSpeed to WheelSpeeds(chassisSpeeds) VI Name Function Prototype diffDriveWheelSpeed to WheelSpeeds(chases) VI Name Function Prototype diffDrOdom new(rotation gyro, pose initial diffDrOdom new(rotation gyro) void resetPosition(pose2d, rotation2d) pose2d getPoseMeters()	Can use cluster constant

1/12/2021 - State Space Items - (This list is s										
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									diffDrWheelSpeeds new(double leftVel, double rightVel)	
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MECANUM DRIVE KINEMATICS		X		X	- 1			MecaKinematics_New.vi		
	Χ	Χ		X	Χ			MecaKinematics_SetInverseKinematics.vi		
	X	Χ		X	Χ			MecaKinematics_ToChassisSpeeds.vi		
	X	X		X	X			MecaKinematics_ToWheelSpeeds.vi		
	Χ	X		Χ	X			MecaKinematics_ToWheelSpeedsZeroCenter.vi		
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notř	ning d	lone X Documented X X	WPILIB	X X Menu Item	imized	Routine	Sample Program	VI Name MecaOdometry_New.vi MecaOdometry_NewDefaultPose.vi MecaOdometry_GetPose.vi MecaOdometry_GetPose.vi		
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MECANUM DRIVE ODOMETRY	umplemented X X X X X X X X X X X X X X X X X X X	Documented X X X Documented	Not WPILIB	Menu Item	Execution Optimized	Routine	Sample Program	VI Name MecaOdometry_New.vi MecaOdometry_NewDefaultPose.vi MecaOdometry_GetPose.vi MecaOdometry_Execute.vi MecaOdometry_Reset.VI MecaOdometry_Update.vi MecaOdometry_UpdateWithTime.vi	Function Prototype Function Prototype	
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MECANUM DRIVE ODOMETRY	unplemented X X X X X X X X X X X X X X X X X X X	Documented X X X Documented	X Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name MecaOdometry_New.vi MecaOdometry_NewDefaultPose.vi MecaOdometry_GetPose.vi MecaOdometry_Execute.vi MecaOdometry_Reset.VI MecaOdometry_Update.vi MecaOdometry_UpdateWithTime.vi	Function Prototype Function Prototype public MecanumDriveWheelSpeeds(double frontLeftMetersPerSecond, double frontRightMetersPerSecond, double rearLeftMetersPerSecond, double	Notes
MECANUM DRIVE ODOMETRY	uning d	X X Documented X X X	X Not WPILIB	X X X X X X X X X X X X X X X X X X X	2 Execution Optimized	Test Routine	Sample Program Sample Program	VI Name MecaOdometry_New.vi MecaOdometry_NewDefaultPose.vi MecaOdometry_GetPose.vi MecaOdometry_Execute.vi MecaOdometry_Reset.VI MecaOdometry_Update.vi MecaOdometry_UpdateWithTime.vi	Function Prototype Function Prototype public MecanumDriveWheelSpeeds(double frontLeftMetersPerSecond, double frontRightMetersPerSecond, double rearLeftMetersPerSecond, double	Notes
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021 – State Space items – (This list is s	, , , , , , , , , , , , , , , , , , , ,	1331116	y Onc	V 1	<i>,</i> Add	cu au	uition	ar columns for test and sample.		
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	_	ದ್ದಿ	8	Ме	Ë	Je Je	Sa,	/I Name	Function Prototype	Notes
SWERVE DRIVE KINEMATICS									public SwerveDriveKinematics(Translation2d wheelsMeters)	variable parameters (replace with array and "4" calls)
	X	Χ	X	X			5	SwerveKinematics NewX.VI		uses array as input
	X	X	X	X				SwerveKinematics_New4.VI		For 4 module drives
	X	X		X			(SwerveKinematics_ToSwerveModuleStates.VI	public SwerveModuleState[]	
									toSwerveModuleStates(ChassisSpeeds chassisSpeeds, Translation2d centerOfRotationMeters)	
	X	X		X				SwerveKinematics_ToSwerveModuleStatesZeroCenter.VI	public SwerveModuleState[]	
									toSwerveModuleStates(ChassisSpeeds chassisSpeeds)	veniele a secondare (secondare veible
									public ChassisSpeeds toChassisSpeeds(SwerveModuleState wheelStates)	variable parameters (replace with array and "4" calls)
	Χ			Χ				SwerveKinematics_ToChassisSpeedsX.VI		uses array as input
	X			X				SwerveKinematics_ToChassisSpeeds4.VI		For 4 module drives
	X	X	X	X				SwerveKinematics_NormalizeWheelSpeeds.vi	public static void normalizeWheelSpeeds(SwerveModuleState[] moduleStates, double attainableMaxSpeedMetersPerSecond)	
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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program			
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			ຸ ≥		_ <u>~</u>			/I Name		Notes
SWERVE DRIVE ODOMETRY	X	X		X			(SwerveOdometry_New.VI	public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose)	
	X	Χ		X				SwerveOdometry_NewZeroCenter.VI	public SwerveDriveOdometry(SwerveDriveKinematics kinematics,	
	X	X		X				SwerveOdometry ResetPosition.VI	Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)	
	X			X				SwerveOdometry_GetPosition.VI	public Pose2d getPoseMeters()	
									public Pose2d updateWithTime(double currentTimeSeconds,	variable parameters (replace with
	Y	Y	X	X			9	SwerveOdometry_UpdateWithTimeX.VI	Rotation2d gyroAngle, SwerveModuleState moduleStates)	array and "4" calls) uses array as input
	\overline{X}	X	$\frac{\lambda}{X}$	X				SwerveOdometry UpdateWithTime4.VI		For 4 module drives
									public Pose2d update(Rotation2d gyroAngle,	variable parameters (replace with
								SwerveOdometry_Execute4.vi	SwerveModuleState moduleStates)	array and "4" calls)
				1				SwerveOdometry_Execute4.vi		
	Х		X	X				SwerveOdometry_UpdateX.VI		uses array as input
	X	X	X	X			(SwerveOdometry_Update4.VI		For 4 module drives
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			_ 8_			Je Je		/I Name		Notes
SWERVE DRIVE MODULE STATE	X	X		X	SI			SwerveModuleState_New.vi	public SwerveModuleState(double speedMetersPerSecond,	
	X	X		X	SI			SwerveModuleState_CompareTo.vi	Rotation2d angle) public int compareTo(SwerveModuleState o)	
	X			X	SI			SwerveModuleState_Optimize.vi	public SwerveModuleState optimize(SwerveModuleState desired,	
								- :	Rotation2d angle)	

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

- State Space Items – (This list is s	still mi	issing	one	VI)	Add	ed ad	ditior	nal columns for test and sample.	_	
CUBIC HERMITE SPLINE	X /mplemented	X Nocumented	Not WPILIB	X X X X X X X X X X	Execution Optimize	Test Routine		VI Name CubicHermiteSpline_New.vi CubicHermiteSpline_makeHermiteBasis.vi CubicHermiteSpline_getControlVectorFromArrays.vi	Function Prototype public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector) protected SimpleMatrix getCoefficients() private SimpleMatrix makeHermiteBasis() private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector)	Notes not needed, use cluster unpack
POSE WITH CURVATURE	X Implemented	X Documented	Not WPILIB	X Menu Item	9 Execution Optimized	Test Routine		VI Name PoseWithCurve_New.vi	Function Prototype public PoseWithCurvature(Pose2d poseMeters, double curvatureRadPerMeter) public PoseWithCurvature() public Pose2d poseMeters public double curvatureRadPerMeter	Notes can use cluster constant not needed, use cluster unpack not needed, use cluster unpack
QUINTIC HERMITE SPLINE	X X Implemented	X Documented	Not WPILIB	X Wenu Item	Execution Optimized	Test Routine		VI Name QuinticHermiteSpline_New.vi QuinticHermiteSpline_makeHermiteBasis.vi QuinticHermiteSpline_getControlVectorFromArrays.vi	Function Prototype public QuinticHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector) protected SimpleMatrix getCoefficients() private SimpleMatrix makeHermiteBasis() private SimpleMatrix getControlVectorFromArrays(double[]	Notes not needed, use cluster unpack
SPLINE (Abstract class)	X Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine		VI Name Spline_getPoint.vi	Function Prototype Spline(int degree) public PoseWithCurvature getPoint(double t) public static class ControlVector public ControlVector(double[] x, double[] y)	Notes implemented as data structure
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes

Revision 2.X 11/12/2021 – State Space Items – (This list is still missing one VI....) Added additional columns for test and sample.

SPLINE HELPER X X X SplineHelp GetCubicCtrlVectorsFron

stil	l missin	g one	VI)) Add	ed ac	ditional columns for test and sample.		
R	XX		X		X	SplineHelp_GetCubicCtrlVectorsFromWayPts.vi	public static Spline.ControlVector[] getCubicControlVectorsFromWaypoints(Pose2d start, Translation2d[] interiorWaypoints, Pose2d end)	
	X X	X	X			SplineHelp GetCubicCtrlVectorsFromWeightedWayPts.vi	71 , ,	
	XX		X			SplineHelp_GetQuinticCtrlVectorsFromWayPts.vi	public static List <spline.controlvector> getQuinticControlVectorsFromWaypoints(List<pose2d> waypoints)</pose2d></spline.controlvector>	
	$X \mid X$	X	X			SplineHelp_GetQuinticCtrlVectorsFromWeightedWayPts.vi	,	
	XX		X		X	SplineHelp_getCubicSplinesFromControlVectors.vi	public static CubicHermiteSpline[] getCubicSplinesFromControlVectors(Spline.ControlVector start, Translation2d[] waypoints, Spline.ControlVector end)	
	$X \mid X$	X	No			SplineHelp_GetCubicSpline_Calc1.vi		internal
	$X \mid X$	X	No			SplineHelp_GetCubicSpline_Calc2.vi		internal
	$X \mid X$	X	No			SplineHelp_GetCubicSpline_Calc3.vi		internal
	X X		X			SplineHelp_getQuinticSplinesFromControlVectors.vi	public static QuinticHermiteSpline[] getQuinticSplinesFromControlVectors(Spline.ControlVector[] controlVectors)	
	XX		No			SplineHelp_ThomasAlgorithm.vi	private static void thomasAlgorithm(double[] a, double[] b, double[] c, double[] d, double[] solutionVector)	internal
	XX		X	SI		SplineHelp_GetCubicCtrlVector.vi	private static Spline.ControlVector getCubicControlVector(double scalar, Pose2d point)	
	XX		X	SI		SplineHelp_GetQuinticCtrlVector.vi	private static Spline.ControlVector getQuinticControlVector(double scalar, Pose2d point)	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program ameN IA			Notes
SPLINE PARAMETERIZER	X	X		X		X	SplineParan	m_Spline.vi	public static List <posewithcurvature> parameterize(Spline spline)</posewithcurvature>	
	X	X		X			SplineParan	m_Spline_T0_T1.vi	public static List <posewithcurvature> parameterize(Spline spline, double t0, double t1)</posewithcurvature>	
	X	Χ	X	No			SplineParan	m_StackGet.vi		internal
	X	X	X	No			SplineParan	m_StackPop.vi		internal
	X	X	X	No			SplineParan	m StackPush.vi		internal

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

> VI Name Function Prototype Notes TRAJECTORY X X public Trajectory(final List<State> states) X SI Trajectory New.vi XX X SI Trajectory_New_Empty.vi public Pose2d getInitialPose() can use cluster unpack, array index public double getTotalTimeSeconds() not needed, use unpack public List<State> getStates() not needed, use unpack X X X X X public State sample(double timeSeconds) Trajectory Sample.vi Trajectory_SampleReverse.vi Sample in reverse order. Negate sample. XX Trajectory_Concatenate.vi Χ public Trajectory transformBy(Transform2d transform) $X \mid X$ Trajectory_TransformBy.vi $X \mid X$ X Trajectory_RelativeTo.vi public Trajectory relativeTo(Pose2d pose) XX boolean equals(other obj) FUTURE Χ Trajectory_equals.vi $X \mid X$ No SI Trajectory_lerp_double.vi private static double lerp(double startValue, double endValue, internal XX No SI private static Pose2d lerp(Pose2d startValue, Pose2d endValue, Trajectory_lerp_Pose.vi

RAJECTORY_STATE	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Namp Program	Function Prototype public State()	Notes
	X	Х		Х	SI		TrajectoryState_New.vi	public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter)	
	X	Χ		Χ			TrajectoryState_Interpolate.vi	State interpolate(State endValue, double i)	
	X	X		X			TrajectoryState_Equals.vi	boolean equals(other obj)	FUTURE

	'mplemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Nample Program	Function Prototype	Notes
TRAJECTORY CONFIG	X	X		X	SI		TrajectoryConfig_Create.vi	public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq)	
								public TrajectoryConfig addConstraint(TrajectoryConstraint constraint)	Implemented differently, can't duplicate.
								public TrajectoryConfig addConstraints(List extends<br TrajectoryConstraint> constraints)	Implemented differently, can't duplicate.
	X	X		X	SI		TrajectoryConfig_setKinematicsDiffDrive.vi	public TrajectoryConfig setKinematics(DifferentialDriveKinematics kinematics)	
	X	X		X	SI		TrajectoryConfig_setKinematicsMecanumfDrive.vi	public TrajectoryConfig setKinematics(MecanumDriveKinematics kinematics)	
	X	X		X	SI		TrajectoryConfig_setKinematicsSwerveDrive.vi	public TrajectoryConfig setKinematics(SwerveDriveKinematics kinematics)	
								public double getStartVelocity()	can use cluster unpack
								public TrajectoryConfig setStartVelocity(double startVelocityMetersPerSecond)	
								public double getEndVelocity()	can use cluster unpack
								public TrajectoryConfig setEndVelocity(double endVelocityMetersPerSecond)	
								public double getMaxVelocity()	can use cluster unpack
								public double getMaxAcceleration()	can use cluster unpack
								public List <trajectoryconstraint> getConstraints()</trajectoryconstraint>	Implemented differently, can't duplicate.
								public boolean isReversed()	can use cluster unpack
	Χ	Χ		X	SI		TrajectoryConfig_setReversed.vi	public TrajectoryConfig setReversed(boolean reversed)	
	X	Χ	X	X	SI		TrajectoryConfig_setCentripetalAccel.vi		
	X	Χ	X	X	SI		TrajectoryConfig_setVoltageDiffDrive.vi		
								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
TRAJECTORY GENERATE	X	X		Χ				TrajectoryGenerate_Make_Cubic_CtrlVect.vi	public static Trajectory generateTrajectory(Spline.ControlVector initial, List <translation2d> interiorWaypoints, Spline.ControlVector end, TrajectoryConfig config)</translation2d>	uses cubic splines
	Χ	X		X				TrajectoryGenerate_Make_Cubic.vi		uses cubic splines

on 2.X 11/12/2021 – State Space Items – (This list is s					Adde	d add		al columns for test and sample.		
	X		X						Helper to bring these all together	Use this one!!!
	Χ	X		X					public static Trajectory generateTrajectory(ControlVectorList controlVectors, TrajectoryConfig config)	uses quintic splines
	X	X		X			-	rajectoryGenerate_Make_Quintic.vi	public static Trajectory generateTrajectory(List <pose2d> waypoints, TrajectoryConfig config)</pose2d>	uses quintic splines
	Χ	X		Χ			-	rajectoryGenerate_splinePointsFromSplines.vi	public static List <posewithcurvature> splinePointsFromSplines(Spline[] splines)</posewithcurvature>	
TRAJECTORY GENERATE (Control Vector)	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program		Function Prototype public ControlVectorList(int initialCapacity) public ControlVectorList() public ControlVectorList(Collection extends Spline.ControlVector collection)	Notes may not need, just data may not need, just data may not need, just data
	mplemented	Documented	Vot WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program			
	_		Not		Exe				Function Prototype	Notes
TRAJECTORY PARAMETERIZE		X		X					public static Trajectory timeParameterizeTrajectory(List <posewithcurvature> points. List<trajectoryconstraint> constraints, double startVelocityMetersPerSecond, double endVelocityMetersPerSecond, double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq, boolean reversed) private static void enforceAccelerationLimits(boolean reverse,</trajectoryconstraint></posewithcurvature>	
	X	X		No					private static void enforceAccelerationLimits(boolean revérse, List <trajectoryconstraint> constraints, ConstrainedState state)</trajectoryconstraint>	This routines needs to be char when new constraints are add
	Χ							rajectoryParam_calcStuffFwd.vi		
	Χ	X		No				rajectoryParam_calcStuffRev.vi		
	X	X	X	No				rajectoryParam_enforceVelocity.vi		This routines needs to be cha when new constraints are add
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	'I Name	Function Prototype	Notes
AJECTORY PARAMETERIZE CONSTRAINED STATE		X	<	X	E			ConstrainedState_New.vi	ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double maxAccelerationMetersPerSecondSq) ConstrainedState()	110.65
	V	V	Х	Χ			(ConstrainedState SetMaxAccel.vi	V	
		_ ^ '								The state of the s
		X	X	X				ConstrainedState_SetMinAccel vi		
	X	Χ	X	Χ			(ConstrainedState_SetMinAccel.vi ConstrainedState_SetVelAccel.vi		

Revision 2.X 11/12/2021 – State Space Items – (This list is still missing one VI....) Added additional columns for test and sample. nple Program Test Routine Not WPILIB Menu Item Function Prototype Notes TrajectoryUtil fromPathWeaverJSON.vi TRAJECTORY UTIL X X X public static Trajectory fromPathweaverJson(Path path) X X X X X TrajectoryUtil MakeWeightedWayPoint.vi TrajectoryUtil MakeWeightedWayPoint ENG.vi X X X X X $X \mid X$ TrajectoryUtil_toPathWeaverJSON.vi public static void toPathweaverJson(Trajectory trajectory, Path public static Trajectory deserializeTrajectory(String json) public static String serializeTrajectory(Trajectory trajectory) Execution Optimized Sample Progr Test Routine Menu Item **Function Prototype** Notes TRAPEZOID PROFILE X X Χ TrapProfConstraint New.vi $X \mid X$ Χ TrapProfile Calculate.vi XX No TrapProfile Direct.vi Private, remove from menu $X \mid X \mid X \mid X$ TrapProfile Execute.vi XX Χ TrapProfile IsFinished.vi $X \mid X$ Χ TrapProfile New.vi $X \mid X$ Χ TrapProfile New DefInitial.vi $X \mid X$ No TrapProfile ShouldFlipAcceleration.vi Private, remove from menu TrapProfile TimeLeftUntil.vi $X \mid X$ Χ $X \mid X$ Χ TrapProfile TotalTime.vi TrapProfState Equals.vi $X \mid X$ Χ $X \mid X$ Χ TrapProfState New.vi '======== TRAJECTORY CONSTRAINT '========= Execution Optimize Sample Prog Test Routine Vot WPILIB Vlenu Item VI Name Function Prototype Notes CENTRIPETAL ACCELERATION CONSTRAINT X public double getMaxVelocityMetersPerSecond(Pose2d CentripetalAccelConstraint_getMaxVelocity.vi poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)
public MinMax XX CentripetalAccelConstraint getMinMaxAccel.vi Χ getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public CentripetalAccelerationConstraint(double $X \mid X$ X SI CentripetalAccelConstraint New.vi Can use cluster pack for now maxCentripetalAccelerationMetersPerSecondSq) Execution Optimized Sample Program rest Routine Not WPILIB **Menu Item** Function Prototype Notes

			_				onal columns for test and sample.		
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		X	SI		DiffDriveKinematicsConstraint_New.vi	public DifferentialDriveKinematicsConstraint(final DifferentialDriveKinematics kinematics, double maxSpeedMetersPerSecond)	
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	VI Name	Function Prototype	Notes
DIFF DRIVE VOLTAGE CONSTRAINT		X		_ <u>≥</u> 	Щ	<u> </u>	DiffDriveVoltageConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d	Notes
							5 _5	poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X			DiffDriveVoltageConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	Code updated to match 2/20 library update.
	X	X		X	SI		DiffDriveVoltageConstraint_New.vi	public DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	Can use cluster pack for now
	Implemented	Documentea		Menu Item	Execution	Test Routine			Notes
JERK CONSTRAINT	/	\vdash	X				JerkConstraint_getMaxVelocity.vi JerkConstraint_getMinMaxAccel.vi		FUTURE FUTURE
	/		X		SI		JerkConstraint_New.vi		FUTURE
	Implemented	Documented		Menu Item	Execution Optimized	Test Routine	VI Name	Function Prototype	Notes
MECANUM DRIVE KINEMATICS CONSTRAINT		X		X	SI		MecaDriveKinematicsConstraint_New.vi MecaDriveKinematicsConstraint_getMaxVelocity.vi		
	X	X		X			MecaDriveKinematicsConstraint_getMaxVelocity.vi MecaDriveKinematicsConstraint_getMinMaxAccel.vi		
	mplemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	VI Name	Function Prototype	Notes
SWERVE DRIVE KINEMATICS CONSTRAINT	_	X		X	E	<u>- </u>	SwerveDriveKinematicsConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	140[65
	X	X		X			SwerveDriveKinematicsConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	

		 ,		 			
Χ	Χ	Χ	SI		SwerveDriveKinematicsConstraint_New.vi	Newpublic SwerveDriveKinematicsConstraint(final	Can use cluster pack for now
						SwerveDriveKinematics kinematics, double	Ť
						maxSpeedMetersPerSecond)	

TRAJECTORY CONSTRAINT

Interface class - nothing done (not needed)

Function Prototype VI Name Notes TRAJECTORY CONSTRAINT (Min Max) X X Constraint_MinMax_New.vi Constraint MinMax New X SI Constraint MinMax NewMinMax.VI Constraint MinMax New XX X SI

'=========

UTILITY

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes
UTIL	X	Χ	Χ	Χ	SI		Util ApproxEqual.vi		
	X	Χ	X	X			Util_Array_PoseWCurv_to_XY.vi		
	X	Χ	X	X	SI		Util_CalcDist.vi		
	X	Χ	X	Χ			Util_GetLibraryUsage.vi		
	Χ	X	X	X	SI		Util_GetLibraryVersion.vi		
	X	X	X	X			Util_GetTime.vi		Once tested completely, this should be optimized!
	Χ	X	X	No	N/A		Util_LibraryGlobals.vi		Global Variables – no block diag.
	X	Χ	Χ	Χ			Util_Trajectory_Absolute_To_Relative.vi		
	X	X	X	Χ			Util_Trajectory_ReadFile.vi		
	X	Χ	X	Χ			Util_Trajectory_to_XY.vi		
	X	Χ	X	No			Util_Trajectory_WriteFile_Config.vi		internal
	X	Χ	X	No			Util_Trajectory_WriteFile_OneState.vi		internal
	X	Χ	X	Χ			Util_Trajectory_WriteFile_PathFinder.vi		
	X	Χ	X	No			Util_Trajectory_WriteFile_PathFinderConfig.vi		internal
	X	X	X	Χ			Util_Trajectory_WriteFile_Pathweaver.vi		
	X	Χ	X	No			Util_Trajectory_WriteFile_States.vi		internal
	X	X	X	No			Util_Trajectory_WriteFile_WayPoints.vi		internal
	X	Χ	Χ	Χ			Util_Trajectory_WriteFile.vi		
	X	X	X	Χ			Util_TrajectoryState_Meters_To_Inches.vi		
	X	Χ	Χ	Χ			Util_TrajState_to_DiffDrive_WheelPos.vi		
	X	Χ	Χ	Χ			Util_Waypoint_Eng_To_SI.vi		
	X	X	Χ	Χ			Util_Waypoint_To_CubicInput.vi		
	X	X	X	Χ			Util_Waypoint_To_QuinticInput.vi		
	X	X	X	No			Util_WeightedWayPoint_To_WeightedWayPoint.vi		Sorry about the confusing name

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CONVERSIONS

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 ame	Function Prototype	Notes
CONV	Χ	X	Χ	Χ	SI		Conv_AngleDegrees_Heading.vi		
	Χ	X	Χ	Χ	SI		Conv_AngleRadians_Heading.vi		
	Χ	X	Χ	Χ	SI		Conv_Centimeters_Meters.vi		
	Χ	Χ	Χ	Χ	SI		Conv_Deg_Radians.vi		
	Χ	X	Χ	Χ	SI		Conv_Feet_Meters.vi		
	Χ	X	X	Χ	SI		Conv_GyroDegrees_Heading.vi		
	Χ	X	Χ	Χ	SI		Conv_Heading_AngleRadians.vi		
	Χ	X	X	Χ	SI		Conv_Inches_Meters.vi		
	Χ	X	Χ	Χ	SI		Conv_Kilograms_Pounds.vi		
	X	X	Χ	Χ	SI		Conv_Meters_Feet.vi		
	X	X	Χ	Χ	SI		Conv_Meters_Inches.vi		
	Χ	X	Χ	Χ	SI		Conv_POSE_SI_Eng.vi		
	Χ	X	X	Χ	SI		Conv_Pounds_Kilograms.vi		
	Χ	X	Χ	Χ	SI		Conv_Radians_Deg.vi		
	Χ	X	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	X		X				Units_DegreesToRadians.vi		
	Χ	Χ		X				Units_FeetToMeters.vi		
	Χ	Χ		Χ				Units_InchesToMeters.vi		
	Χ	X		X				Units_MetersToFeet.vi		
	Χ	X		X				Units_MetersToInches.vi		
	Χ	Χ		X				Units_RadiansPerSecondToRotationsPerMinute.vi		
	Χ	X		X				Units_RadiansToDegrees.vi		
	Χ	Χ		Χ				Units_RotationsPerMinuteToRadiansPerSecond.vi		

'======== PATHFINDER UTIL

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

Function Prototype Notes PathfinderUtil_Continuous_Heading_Difference.vi PathfinderUtil_Continuous_Heading_Differer
PathfinderUtil_OptimizeTrajectoryStates.vi
PathfinderUtil_ToTrajectoryStates.vi
PathfinderUtil_ToTrajectoryStates.vi

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

Revision 2.X 11/12/2021 – State Space Items – (This list is still missing one VI....) Added additional columns for test and sample.

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	Implemented	Documented	>	Menu Item	Execution Optimizec Test Routine	mble	VI Name	Function Prototype Notes	Code Review	Test Program	Error Checking
DC MOTOR	X	X		X	SI		DCMotor_GetAndymark9015.vi				
	Χ	X		X	SI		DCMotor_GetAndymarkRs775_125.vi				
	X	X			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				
	Χ	X		X	SI		DCMotor_GetCurrent.vi				
	Χ	X		X	SI		DCMotor_GetFalcon500.vi				
	X	X		X	SI		DCMotor_GetMiniCIM.vi				
	X	X		X	SI		DCMotor_GetNEO.vi				
	Χ	X			SI		DCMotor_GetNEO550.vi				
	X	X		X	SI		DCMotor_GetVex775Pro.vi				
	X	X		X	SI		DCMotor_GetRomiBuiltIn.vi				
	Χ	X		X	SI		DCMotor_New.vi				
	Χ	X		X			DCMotor_PickMotor.vi				

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

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

> Function Prototype DIFFERENTIAL DRIVE POSE ESTIMATOR X X X DiffDrivePoseEst_AddVisionMeasurement.vi Just a shell, not functional! X X X X X X Χ DiffDrivePoseEst_FillStateVector.vi DiffDrivePoseEst GetEstimatedPosition.vi Χ Χ DiffDrivePoseEst Kalman F Callback.vi Χ DiffDrivePoseEst Kalman H Callback.vi X X X X Χ DiffDrivePoseEst New.vi Χ DiffDrivePoseEst ResetPosition.vi XX Х DiffDrivePoseEst SetVisionMeasurementStdDevs.vi XX X DiffDrivePoseEst_Update.vi XX Χ DiffDrivePoseEst_UpdateWithTime.vi XX Χ DiffDrivePoseEst_VisionCorrect_Callback.vi

DiffDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi

molemented	Documented	Not WPILIB	Menu Item Execution Optimizec	S VI Name Function Prototype Notes	Code Review	est Program	
				Notes Suppose Notes		¥	_
EXTENDED KALMAN FILTER			X		ll, not functional!		-
	(X		X	ExtendedKalmanFilter_Correct_OnlyUY.vi			+
<u> </u>	(X		X	ExtendedKalmanFilter_GetP.vi			+
	(X		X	ExtendedKalmanFilter_GetP_Single.vi			+
	(X		X X	ExtendedKalmanFilter_GetXHat.vi			+
	(X			ExtendedKalmanFilter_GetXHat_Single.vi ExtendedKalmanFilter New.vi			+
X			X X	ExtendedKalmanFilter_New.vi ExtendedKalmanFilter Predict.vi			+
	(X		X	ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter Reset.vi			+
	(X		X	ExtendedKalmanFilter_Reset.vi ExtendedKalmanFilter SetP.vi			+
	(X		X	ExtendedKalmanFilter_SetX-vi			+
<u>^</u>	(X		X	ExtendedKalmanFilter_SetXHat_Single.vi			+
<u> </u>	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	+	^	Extended (dimenting little _oct/clide_olingle.vi			+
			Menu Item Execution	E B B B B B B B B B B B B B B B B B B B	Code R	Test Pro	Т
KALMAN FILTER			X	KalmanFilter_Correct.vi			+
X	(X X X		X X	KalmanFilter_New.vi KalmanFilter Predict.vi			+
	(X		X	KalmanFilter_Predict.vi KalmanFilter_Reset.vi		+	+
	(X		X	KalmanFilter GetK			+
	(X		X	KalmanFilter_GetK_Single.vi			+
	(X		X	KalmanFilter SetXHat		+	+
	(X		X	KalmanFilter_SetXHat_Single			\dagger
λ			X	KalmanFilter_GetXHat			\dagger
	(X		X	KalmanFilter_GetXHaT_Single			T
1	ented	Not WPILIB	Menu Item Execution Optimized	S VI Name Function Prototype Notes	Code Review	est Program	
nemelu	moo	ot 1	ě ě		Ō	<u>F</u>	\top
ILTER LATENCY COMPENSATOR $\overline{\lambda}$	(X		X	KalmanFilterLatencyComp_AddObserverState.vi Work in p	ogress.		\top
	(X				ogress.		T
ILTER LATENCY COMPENSATOR X	(X		X	KalmanFilterLatencyComp_AddObserverState.vi Work in p			
ILTER LATENCY COMPENSATOR X	(X (X		X X	KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.vi Work in p	ogress.		
ILTER LATENCY COMPENSATOR X			X X X	KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.vi Work in p	ogress.		_
ILTER LATENCY COMPENSATOR X			X X X	KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.vi Work in p	ogress.		

FRC LabVIEW Trajectory Library - VI Implementation List Revision 2.X 11/12/2021 - State Space Items - (This list is still missing one VI....) Added additional columns for test and sample. nple Program Function Prototype Notes SWERVE DRIVE POSE ESTIMATOR SwerveDrivePoseEst AddVisionMeasurement StdDev.vi Haven't started yet X X X X SwerveDrivePoseEst AddVisionMeasurement.vi Haven't started yet X SwerveDrivePoseEst VisionCorrect Callback.vi XX X SwerveDrivePoseEst VisionCorrect Kalman H Callback.vi XX Χ SwerveDrivePoseEst Kalman F Callback.vi XX X SwerveDrivePoseEst Kalman H Callback.vi XX Χ SwerveDrivePoseEst GetEstimatedPosition.vi Haven't started yet XX X SwerveDrivePoseEst New.vi Haven't started yet $X \mid X$ Χ SwerveDrivePoseEst ResetPosition.vi Haven't started yet XX Χ SwerveDrivePoseEst SetVisionMeasurementStdDevs.vi Haven't started yet XX X SwerveDrivePoseEst Update.vi Haven't started yet XX Χ SwerveDrivePoseEst UpdateWithTime.vi Haven't started yet Haven't started yet **Function Prototype** Notes UNSCENTED KALMAN FILTER X Χ UnscentedKalmanFilter Correct.vi Work in progress. Χ UnscentedKalmanFilter Correct FuncGroup.vi X UnscentedKalmanFilter Correct OnlyUY.vi Χ X UnscentedKalmanFilter Correct OnlyUYR.vi XX Χ UnscentedKalmanFilter GetP.vi XX X UnscentedKalmanFilter GetP Single.vi UnscentedKalmanFilter GetXHat.vi $X \mid X$ Χ UnscentedKalmanFilter GetXHat Single.vi $X \mid X$ Χ Χ Χ UnscentedKalmanFilter New.vi Χ X UnscentedKalmanFilter New Default.vi Χ X UnscentedKalmanFilter New FuncGroup.vi X X Χ UnscentedKalmanFilter Predict.vi XX Χ UnscentedKalmanFilter Reset.vi XX Χ UnscentedKalmanFilter SetP.vi XX X UnscentedKalmanFilter SetXHat.vi XX UnscentedKalmanFilter_SetXHat_Single.vi Χ Χ UnscentedKalmanFilter_Transform.vi '======== STATE SPACE CONTROL '======== Not WPILIB **Function Prototype** Notes CONTROL AFFINE PLANT INVERSION FEEDFORWARD

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LINEAR PLANT INVERSION FEEDFORWARD	X		X			LinearPIntInvFF_Calculate.vi	7.			
	Χ	Χ	X			LinearPIntInvFF_Calculate_NextR.vi				
	X	X	X			LinearPIntInvFF_GetUff.vi				
	X		X			LinearPIntInvFF_New.vi				
		X	X			LinearPIntInvFF_New_Plant.vi				
		X	X			LinearPIntInvFF_Reset_Initial.vi				
		X	X			LinearPIntInvFF_Reset_Zero.vi				
	X		X			LinearPIntInvFF_GetUff_Single.vi				
		Χ	X			LinearPIntInvFF_GetR.vi				
	X	Χ	X			LinearPIntInvFF_GetR_Single.vi				
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LINEAR QUADRATIC REGULATOR			X			LinearQuadraticRegulator_Calculate_NextR.vi				
	X		X			LinearQuadraticRegulator_Calculate.vi				
			X			LinearQuadraticRegulator_GetK_Single.vi		NOT ORIGINAL		
		Χ	X		X	LinearQuadraticRegulator_GetK.vi				
			X			LinearQuadraticRegulator_GetR_Single.vi				
		X	X			LinearQuadraticRegulator_GetR.vi				
			X			LinearQuadraticRegulator_GetU_Single.vi				
		X	X			LinearQuadraticRegulator_GetU.vi				
	/	X	X		X	LinearQuadraticRegulator_LatencyCompensate.vi		Routine exists, but it only has interger raise matrix to power.		
	X	~	X			LinearQuadraticRegulator_New_ELMS.vi		interger raise matrix to power.		
	^	^	^			LinearQuadraticRegulator_New_Raw.vi			+	+
	X	×	X		X	LinearQuadraticRegulator_New_SystemELMS.vi			+	+
		^	^			LinearQuadraticRegulator New N vi				
	X	X	X			LinearQuadraticRegulator_New_N.vi LinearQuadraticRegulator_New.vi			+	+
	X	$\frac{x}{x}$	$\frac{\lambda}{X}$			LinearQuadraticRegulator_Reset.vi			+	+
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LINEAR SYSTEM		\overline{x}	X			LinearSystem CalculateX.vi	71		T	T
	X	X	X	•		LinearSystem_CalculateY.vi			1	
	X	X	X			LinearSystem GetA.vi				
	X	X	X			LinearSystem_GetAElement.vi			T	
	X	X	X			LinearSystem_GetB.vi				1
	X		X			LinearSystem_GetBElement.vi				
	X		X			LinearSystem_GetC.vi				
	X	X	X			LinearSystem_GetCElement.vi				
	X	Χ	X			LinearSystem_GetD.vi				
									T	T
	X	X	X			LinearSystem_GetDElement.vi				

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

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

'========

CALLBACK HELPER	X X Implemented	Documented	X X Not WPILIB	X X Menu Item	Execution Optimized	Test Routine		VI Name CallbackHelp_MatrixMinus.vi CallbackHelp_MatrixMult.vi CallbackHelp_MatrixMult_CoerceSizeB.vi CallbackHelp_MatrixPlus.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	Implemented	Documented	Not WPILIB	Jenu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Sode Review	est Program	error Checking
DISCRETIZATION		X		X		X	,	Discretization_DiscretizeA.vi	T unction i Tototype	Notes			Ш
	X	Χ		Χ		Χ		Discretization_DiscretizeAB.vi					
	X	X		Χ		X		Discretization_DiscretizeABTaylor.vi					

				Discretization_DiscretizeAQ.vi		
X	X	X	X	Discretization_DiscretizeAQTaylor.vi		
X	X	X		Discretization_DiscretizeR.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program awaN IN	Function Prototype	Notes	Code Review	Test Program	Error Checking
STATE SPACE UTIL	X			X		Χ						
	X	X		X		X	StateSpaceUtil_MakeCovarianceMatrix.vi					
	X	Χ		X			StateSpaceUtil_MakeWhiteNoiseVector.vi					
	/	Χ					StateSpaceUtil_IsStabalizable.vi					
	X	Χ		X			StateSpaceUtil_PoseToVector.vi					
	X	Χ		X			StateSpaceUtil_ClampInputMaxMagnitude.vi		Routine exists, it is just a shell			
	X	Χ		Χ			StateSpaceUtil_NomalizeInputVector.vi					
	X	Χ		Χ			StateSpaceUtil_PoseTo4dVector.vi					
	X	X		Χ			StateSpaceUtil_PoseTo3dVector.vi					

'======== SIMULATION '========

> X X Menu Item
>
> ☑ ☑ Execution Optimized Function Prototype Notes BatterySim_CalculateDefaultBatteryLoadedVoltage.vi
> BatterySim_CalculateLoadedVoltage.vi BATTERY SIM X X XX

DIFFERENTIAL DRIVE TRAIN SIN

	Implemented	Documented	Not WPILIB		Execution Op	Routine	NI Name	Function Prototype	Notes	Code Review	Test Program	Error Checkin
		Χ	7	(DiffDriveTrainSim_ClampInput.vi					
	Χ	Χ	_ ;	(DiffDriveTrainSim_CreateKitbotSim.vi					
		Χ		(DiffDriveTrainSim_CreateKitbotSim_EstMass.vi					
		Χ		(DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi					
		Χ		(DiffDriveTrainSim_GetCurrentDrawAmps.vi					
_		Χ		(DiffDriveTrainSim_GetCurrentGearing.vi					
		Χ		(DiffDriveTrainSim_GetDynamics.vi					
		Χ	_	(DiffDriveTrainSim_GetHeading.vi					
		Χ		(DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi					
		X	_	(DiffDriveTrainSim_GetLeftPositionMeters.vi					
_		X		(DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi					
_		Χ		(DiffDriveTrainSim_GetOutput_Single.vi					
		X	_	(DiffDriveTrainSim_GetPose.vi					
_		Χ		(DiffDriveTrainSim_GetRightCurrentDrawAmps.vi					
		X	_	(DiffDriveTrainSim_GetRightPositionMeters.vi					
		Χ		(DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi					
		Χ		(DiffDriveTrainSim_GetState.vi					
	Χ	Χ		(DiffDriveTrainSim_GetState_Single.vi					
	X	Χ	7	(DiffDriveTrainSim_KitBotWheelSize.vi					

		X		X	eu au	itional columns for test and sample. DiffDriveTrainSim New.vi		
	X			X		DiffDriveTrainSim_New_Mass_MOI.vi		
	X	X		X		DiffDriveTrainSim_SetCurrentGearing.vi		
	X	X	\pm	X		DiffDriveTrainSim_SetInputs.vi		
	X	X		X		DiffDriveTrainSim_SetPose.vi		
	X			Х		DiffDriveTrainSim SetState.vi		
	X	X		Х		DiffDriveTrainSim_ToughBoxMiniGearRatio.vi		
	X	X		Χ		DiffDriveTrainSim_ToughBoxMiniMotor.vi		
	X	X		X		DiffDriveTrainSim_Update.vi		
	Implemented	Documented	Not WPILIB	Menu Item Execution Optimized	Test Routine	ample Program	ode Review	Test Program
		_ <u>Ă</u> _		<u>Σ</u> ŵ	<u> </u>	VI Name Function Prototype Notes	Š	`
ELEVATOR				X		ElevatorSim_New.vi		
	X	X		X		ElevatorSim_GetCurrentDraw.vi		
	X	X		X X		ElevatorSim_GetPositionMeters.vi ElevatorSim_GetVelocityMetersPerSecond.vi		
	X			X		ElevatorSim_GetvelocityWetersPerSecond.vi ElevatorSim SetState.vi		
	X	X		X		ElevatorSim_SetState.vi ElevatorSim_SetInputVoltage.vi		
	X	X		X		ElevatorSim_UpdateX.vi		
	X	X	+	X		ElevatorSim_UpdateX.vi		
	X	X	+	X		ElevatorSim_WouldHitUpperLimit.vi		
						ElevatorSim_Update.vi Needed because th	is doesn't	
						extend.		
	X			X		ElevatorSim_HasHitLowerLimit.vi		
	X	X		Χ		ElevatorSim_HasHitUpperLimit.vi		
	X		X	No		ElevatorSim_RKF45_Func.vi		
						ElevatorSim_New_NoNoise.vi		
						ElevatorSim_New_LinSys.vi		
						ElevatorSim_New_LinSys_NoNoise.vi		
	Implemented		Not WPILIB	Menu Item Execution Optimized	st Ro	VI Name Function Prototype Notes	Code Review	Test Program
= : \n.n.=			- 1	X		FlyWheelSim_GetAngularVelocityRadPerSec.vi FlyWheelSim_New_MOI.vi		
FLYWHEEL	SIMX							
FLYWHEEL	SIM X X	X		X		FlyWheelSim SetInput vi		
FLYWHEEL	SIM X X X	X		X X		FlyWheelSim_SetInput.vi		
FLYWHEEL	SIM X X X	X X X		X X X		FlyWheelSim_Update.vi		
FLYWHEEL	SIM X X X X	X X X		X X X		FlyWheelSim_Update.vi FlyWheelSim_GetCurrentDrawAmps		
FLYWHEEL	SIM X X X X X X	X X X X		X X X		FlyWheelSim_Update.vi FlyWheelSim_GetCurrentDrawAmps FlyWheelSim_GetAngularVelocityRPM.vi		
FLYWHEEL	SIM X X X X	X X X		X X X		FlyWheelSim_Update.vi FlyWheelSim_GetCurrentDrawAmps FlyWheelSim_GetAngularVelocityRPM.vi FlyWheelSim_SetState.vi		
FLYWHEEL	SIM X X X X X X	X X X X		X X X		FlyWheelSim_Update.vi FlyWheelSim_GetCurrentDrawAmps FlyWheelSim_GetAngularVelocityRPM.vi FlyWheelSim_SetState.vi FlyWheelSim_New_LinSys_NoNoise Future		
FLYWHEEL	SIM X X X X X X	X X X X		X X X		FlyWheelSim_Update.vi FlyWheelSim_GetCurrentDrawAmps FlyWheelSim_GetAngularVelocityRPM.vi FlyWheelSim_SetState.vi FlyWheelSim_New_LinSys_NoNoise Future		
FLYWHEEL	SIM X X X X X X	X X X X		X X X		FlyWheelSim_Update.vi FlyWheelSim_GetCurrentDrawAmps FlyWheelSim_GetAngularVelocityRPM.vi FlyWheelSim_SetState.vi FlyWheelSim_New_LinSys_NoNoise FlyWheelSim_New_LinSys Future		
FLYWHEEL	SIM X X X X X X X X	X X X X X	9	X X X X Optimized	Routine	FlyWheelSim_Update.vi FlyWheelSim_GetCurrentDrawAmps FlyWheelSim_GetAngularVelocityRPM.vi FlyWheelSim_SetState.vi FlyWheelSim_New_LinSys_NoNoise FlyWheelSim_New_LinSys Future	Review	Program
FLYWHEEL	SIM X X X X X X	X X X X X	9	X X X	Test Routine	FlyWheelSim_Update.vi FlyWheelSim_GetCurrentDrawAmps FlyWheelSim_GetAngularVelocityRPM.vi FlyWheelSim_SetState.vi FlyWheelSim_New_LinSys_NoNoise FlyWheelSim_New_LinSys Future	Code Review	Test Program

o ouii	mooni	y one	v 1)	Auu	ieu auc	ditional columns for test and sample.		
λ	X		X			LinearSystemSim_GetOutput_Single.vi		
λ	X		X			LinearSystemSim_New		
λ			X			LinearSystemSim_SetInput_Single.vi		
λ			X			LinearSystemSim_Update.vi		
λ			No			LinearSystemSim_UpdateX.vi		
λ	X	X	No			LinearSystemSim_UpdateY.vi		
						LinearSystemSim_New_NoNoise.vi		
λ	X		X			LinearSystemSim_SetInput.vi		
λ	X		X			LinearSystemSim_SetInput_Array.vi	Doesn't use clamp ?	
λ	X		X			LinearSystemSim_Setstate.vi		
						LinearSystemSim_GetCurrentDrawAmps.vi	DONT IMPLEMENT	
λ	` X		X			LinearSystemSim_ClampInput.vi		

	Jen	O	Not WPILIB	Mend teni	Execution Optimized Test Routine	mple F	Function Prototype	Notes	Code Review	Test Program	Error Checking
SINGLE JOINT ARM SIM		X		(SngJntArmSim_EsitmateMOI.vi					
		X		(SngJntArmSim_GetAngleRads.vi					
	X	X)	(SngJntArmSim_GetCurrentDraw.vi					
	X	X)	(SngJntArmSim_GetVelocityRadsPerSec.vi					
	X	X		(SngJntArmSim_HasHitLowerLimit.vi					
	X	X)	(SngJntArmSim_HasHitUpperLimit.vi					
	X	X		(SngJntArmSim_New.vi					
	X	X		lo 📗		SngJntArmSim_Rkf45_Func.vi					
	X	X)	(SngJntArmSim_SetInputVoltage.vi					
	X	X				SngJntArmSim_SetState.vi					
	X	X)	(SngJntArmSim_Update.vi					
	X	X	7	(SngJntArmSim_UpdateX.vi					
	X	X	7	(SngJntArmSim_WouldHitLowerLimit.vi					
	X	X)	(SngJntArmSim_WouldHitUpperLimit.vi					

'======= MATRIX UTILITIES '=======

> VI Name Function Prototype Notes MatBuilder_Fill.vi MatBuilder Create.vi MAT BUILDER X X SI

	_ ^		4	ر _ا ک	· /	INALDUILLEI_Create.VI					
	Implemented	Documented	Not WPILIB	Menu item Frequition Ontimized	Test Routine		Function Prototype	Notes	Code Review	Test Program	Error Checking
MATRIX	X	X		x s	7	Matrix_AssignBlock.vi					
	X	X		X S	3/	Matrix_Block.vi					
	X	X		x s	7	Matrix_Create.vi					
	X	Χ		x s	7	Matrix_Diag.vi					

s still	still missing one VI) Added additional columns for test and sample.										
	<i>X</i>	X	SI		Matrix_ElementSum.vi						
	< X	X	1		Matrix_Exp.vi						
	(X	X	SI		Matrix_ExtractColumnVector.vi						
	< X	X	SI		Matrix_ExtractFrom.vi						
	(X	SI		Matrix_ExtractMatrix.vi						
	< X	X	SI		Matrix_ExtractRowVector.vi						
	(X	X	SI		Matrix_Fill.vi						
	(X	X	1		Matrix_Ident.vi						
	<i>X</i>	X	SI		Matrix_IsEqual.vi						
	<i>X</i>	X	1		Matrix_LItDecompose.vi						
	(X	X	1		Matrix_Pow.vi						
	< X	X	SI		Matrix_SetColumn.vi						
	< X	X	SI		Matrix_SetRow.vi	THERE ARE LOTS OF OTHER MATRIX FUNCTIONS THAT					
						SHOULD BE INCLUDED HERE FOR ISOLATION.					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATRIX HELPER	Χ		Χ	Χ	SI		MatrixHelper_Zero.vi					
	Χ		Χ	Χ	SI		MatrixHelper_CooerceSize.vi					
	Χ		Χ	Χ	SI		MatrixHelper_MultCooerceBSize.vi					

		Documented	Not WPILIB	Menu Item	Execution Optimized	Sample Program emble Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
VECTOR BUILDER	Χ	Χ			SI	VecBuilder_1x1Fill.vi					
		X			SI	VecBuilder_2x1Fill.vi					
	Χ	X			SI	VecBuilder_3x1Fill.vi					
		X			SI	VecBuilder_4x1Fill.vi					
	Χ	X			SI	VecBuilder_5x1Fill.vi					
	Χ	X			SI	VecBuilder_6x1Fill.vi					
	Χ	X			SI	VecBuilder_7x1Fill.vi					
	Χ	X		X	SI	VecBuilder_8x1Fill.vi					
						VecBuilder_9x1Fill.vi					
						VecBuilder_10x1Fill.vi					
	Χ	X	Χ	X	SI	VecBuilder_ArrayBy1Fill.vi					

'========= MATH '=========

> Function Prototype Notes AngleStats_AngleAdd.vi
> AngleStats_AngleAdd_CallbackHelp.vi
> AngleStats_AngleMean.vi

	s still mis									ı	
	X	X	<u> </u>	(X		AngleStats_AngleMean_CallbackHelp.vi					
	X	_X	<i>X</i>	(1	X	AngleStats_AngleResidual.vi					
	X	X	$X \mid X$. X		AngleStats_AngleResidual_CallbackHelp.vi					
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	je.	ű.	\$ \$	700	Test Rou	<u> </u>			apo	λt Ε	
	mple	ŏ,	νος Ve	:	es G	VI Name	Function Prototype	Notes	ŏ	Jes	
MATH UTILIT	$(X \times X)$	X		SI		MathUtil_AngleModulus.vi	T different Fototype	110.00			\top
		X	$\frac{1}{x}$	(SI		MathUtil_Clamp.vi					+
		X	$\frac{\lambda}{\lambda}$	(SI		MathUtil_ApplyDeadband.vi					+-
		X	$+\hat{\lambda}$	SI		MathUtil Clamp Int.vi					+-
		X	$+\hat{\mathbf{x}}$	SI		MathUtil InputModulus.vi					+
			 ^	31		wattrotti_inputwodulus.vi					+
				Ø							
				ize		_					
				, Optim	5	i 0					
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	nte	nte	7 È		utine				šviė	grē	
	че	umen	ξā	<u>:</u>	Sol	<u>.</u>			Re	õ	
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	JLLI	Ď.	S	Ě	ě	VI Name	Function Prototype	Notes	Š	7e	
MERWE SCALED SIGMA POINT	rs X	X				MerweScSigPts_ComputeWeights.vi	71				\top
		X		(SI		MerweScSigPts_GetNumSigmas.vi					\top
		X	- X	(SI		MerweScSigPts_GetWc.vi					\top
		X		(SI		MerweScSigPts_GetWc_Single.vi					+
		X	$\frac{1}{x}$	(SI		MerweScSigPts_GetWm.vi					+
		X	$+\frac{\gamma}{\lambda}$	(SI		MerweScSigPts_GetWm_Single.vi					+
		X	$+\frac{2}{\lambda}$	(1		MerweScSigPts_New.vi					+
		X		()		MerweScSigPts_New_Default.vi					+
											+
	X	Χ	X	(MerweScSigPts_SigmaPoints.vi					+
			\bot								
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				Sec							
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	ıted	nted in	ם ג	Optin	ġ				view	yram	
	nented	nented	г IL IB 'tem	Optin	utine				Review	rogram	
	lemented	umented	vvriLIB Tu Item	Optin	utine				le Review	t Program	
	nplemented	ocumented	iot vvriLIB Ienu Item	Optin	utine		Function Prototype	Notes	ode Review		
NUMEDICAL INTECRATIO	Implemented	Documented	Not WPILIB	Execution Optin	utine	oolog Book VI Name	Function Prototype	Notes	Code Review	Test Program	
NUMERICAL INTEGRATIO		Documented	No	Execution Optin	utine	VI Name NumIntegrate_Func_Ax_Bu_K.vi	Function Prototype	Notes	Code Review		<u></u>
NUMERICAL INTEGRATIO	X	Documented	No No	Execution Optin	utine	VI Name NumIntegrate_Func_Ax_Bu_K.vi NumIntegrate_Func_Bs.vi	Function Prototype	Notes	Code Review		
NUMERICAL INTEGRATIO	X	Documented	No No No	Execution Optin	utine	VI Name NumIntegrate_Func_Ax_Bu_K.vi NumIntegrate_Func_Bs.vi NumIntegrate_Func_Ch.vi	Function Prototype	Notes	Code Review		
NUMERICAL INTEGRATIO	X	Documented	No No No	6 6 6 month of the Execution Optin	utine	VI Name NumIntegrate_Func_Ax_Bu_K.vi NumIntegrate_Func_Bs.vi NumIntegrate_Func_Ch.vi NumIntegrate_Func_Ct.vi	Function Prototype		Code Review		
NUMERICAL INTEGRATIO	X	Documented	No No No No	Execution Optin	utine	VI Name NumIntegrate_Func_Ax_Bu_K.vi NumIntegrate_Func_Bs.vi NumIntegrate_Func_Ch.vi NumIntegrate_Func_Ct.vi NumIntegrate_Rk4_Dbl.vi	Function Prototype	NOT DONE	Code Review		
NUMERICAL INTEGRATIO	X X X /	Documented	No No No X	Execution Optin	utine	VI Name NumIntegrate_Func_Ax_Bu_K.vi NumIntegrate_Func_Bs.vi NumIntegrate_Func_Ch.vi NumIntegrate_Func_Ct.vi NumIntegrate_Rk4_Dbl.vi NumIntegrate_Rk4_K_Dbl.vi	Function Prototype		Code Review		
NUMERICAL INTEGRATIO	X X X / / X	Documented	No No No X X	Execution Optin	utine	VI Name NumIntegrate_Func_Ax_Bu_K.vi NumIntegrate_Func_Bs.vi NumIntegrate_Func_Ch.vi NumIntegrate_Func_Ct.vi NumIntegrate_Rk4_Dbl.vi NumIntegrate_Rk4_K_Dbl.vi NumIntegrate_Rk4_Mat_X.vi	Function Prototype	NOT DONE	Code Review		
NUMERICAL INTEGRATIO	X X X / / X	Documented	No No No No X	Execution Optin	utine	VI Name NumIntegrate_Func_Ax_Bu_K.vi NumIntegrate_Func_Bs.vi NumIntegrate_Func_Ch.vi NumIntegrate_Func_Ct.vi NumIntegrate_Rk4_Dbl.vi NumIntegrate_Rk4_K_Dbl.vi NumIntegrate_Rk4_Mat_X.vi NumIntegrate_Rk4_Mat_X_U.vi	Function Prototype	NOT DONE	Code Review		
NUMERICAL INTEGRATIO	X X X / / X	Documented	No No No X X X X	Execution Optin	utine	VI Name NumIntegrate_Func_Ax_Bu_K.vi NumIntegrate_Func_Bs.vi NumIntegrate_Func_Ch.vi NumIntegrate_Func_Ct.vi NumIntegrate_Rk4_Dbl.vi NumIntegrate_Rk4_K_Dbl.vi NumIntegrate_Rk4_Mat_X.vi	Function Prototype	NOT DONE	Code Review		
NUMERICAL INTEGRATIO	X X X / / X X X	Documented	No No No X X X X	Execution Optin	utine	VI Name NumIntegrate_Func_Ax_Bu_K.vi NumIntegrate_Func_Bs.vi NumIntegrate_Func_Ch.vi NumIntegrate_Func_Ct.vi NumIntegrate_Rk4_Dbl.vi NumIntegrate_Rk4_K_Dbl.vi NumIntegrate_Rk4_Mat_X.vi NumIntegrate_Rk4_Mat_X.vi NumIntegrate_Rk4_Mat_X_U.vi NumIntegrate_Rk4_Mat_X_U.vi	Function Prototype	NOT DONE	Code Review		
NUMERICAL INTEGRATIO	X X X / / X	Documented	No No No No X	Execution Optin	utine	VI Name NumIntegrate_Func_Ax_Bu_K.vi NumIntegrate_Func_Bs.vi NumIntegrate_Func_Ch.vi NumIntegrate_Func_Ct.vi NumIntegrate_Rk4_Dbl.vi NumIntegrate_Rk4_K_Dbl.vi NumIntegrate_Rk4_Mat_X.vi NumIntegrate_Rk4_Mat_X_U.vi	Function Prototype	NOT DONE	Code Review		

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Revision 2.X	11/12/2021 -	- State Space Items - (This list is still missing one VI) Added additional columns for test and sample.

NUMERICAL JACOBIAN	Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine	NumJacobian_X.vi NumJacobian_U.vi	Function Prototype	Notes There are others that may need implemented.	Code Review	Test Program	Error Checking
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
RICCATI	/			Χ			Riccati_Check_Detectable.vi		Routine exists, it is just a shell			
	/			Χ			Riccati_Check_Stabilizable.vi		Not really done !!!			
	X	Χ		X		Χ	Riccati_DARE.vi					
	Χ			Χ		X	Riccati_DARE_Iterate.vi					
	X	Χ		Χ			Riccati_DARE_N.vi					
	Χ			Χ			Riccati_Input_Check.vi					
							1	1				1

'====== TYPE DEFINITIONS '=======

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimizea	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TypeDef	Ζ		Χ	Χ	N/A			ARM_FF.CTL		
	1		Χ	Χ	N/A			BICon-Matrix_FUNC_TYPE.CTL		
	Ζ		X	Χ	N/A			CALLBACK_FUNC_TYPE.CTL		
	Ζ	Χ	Χ	Χ	N/A			CHASSIS_SPEEDS.CTL		
	Ζ	Χ	Χ	Χ	N/A			CONTRAINED_STATE.CTL		
	Ζ		Χ	Χ	N/A			DCMOTOR.CTL		
	Ζ	Χ		Χ	N/A			DIFF_DRIVE_KINEMATICS.CTL		
	Ζ		X	X	N/A			DIFF_DRIVE_Kitbot_WheelSize_ENUM.ctl		
	Ζ		Χ	Χ	N/A			DiFF_DRIVE_POSE_EST.ctl		
	Ζ		X	Χ	N/A			DIFF_DRIVE_ToughBoxMini_GearChoice_ENUM.ctl		
	Ζ		Χ	X	N/A			DIFF_DRIVE_ToughBoxMini_MotorChoice_ENUM.ctl		
	Ζ		Χ	Χ	N/A			DIFF_DRIVE_TRAIN_SIM.ctl		
	Ζ		Χ	Χ	N/A			ELEVATOR_SIM.CTL		
	Ζ		Χ	Χ	N/A			ELEV_FF.CTL		
	Z		Χ	X	N/A			EXTENDED_KALMAN_CORRECT_FUNC_GROUP.CTL		
-	Z		X	X	N/A			EXTENDED_KALMAN_FILTER.CTL		
-	Z		X	X	N/A			FLYWHEEL_SIM.ctl		N 4/00/04
-	Z		X	X	N/A			HOLONOMIC_DRV_CTRL.CTL		New 1/26/21
-	Ζ		X	X	N/A			KALMAN_FILTER.ctl		
-	Z	V	X	X	N/A			KALMAN_FILTER_LATENCY_COMP.CTL		
-	Z	X	X	X	N/A			LINEAR_FILTER.CTL		
	Ζ		Χ	X	N/A			LINEAR_PLANT_INV_FF.ctl		

still mi	ssing				ditional columns for test and sample.	
Z				N/A	LINEAR_QUADRATIC_REGULATOR.ctl	
Z		Χ	X	N/A	LINEAR_SYSTEM_LOOP.ctl	
Z		Χ	Χ	N/A	LINEAR_SYSTEM_SIM.ctl	
Z		Χ	X	N/A	LINEAR SYSTEM.ctl	
Z	Χ	Χ	X	N/A	MECA DRIVE KINEMATICS.CTL	
Z	X	Χ	X	N/A	MECA DRIVE ODOMETRY.CTL	
Z	X	X		N/A	MECA_WHEEL_SPEEDS.CTL	
Z		X	X	N/A	MEDIAN FILTER.CTL	
Z		X	X	N/A	MERWE_SCALED_SIGMA_PTS.ctl	
Z		X	X	N/A	OBSERVER SNAPSHOT.CTL	
Z		\hat{x}	X	N/A	OBSERVER SNAP LIST ITEM.CTL	
Z	Х	X	X	N/A	PARAM STACK ITEM.CTL	
Z	\hat{x}	X	X	N/A	PARAM STACK.CTL	
Z	^	X	X	N/A	PID ADV LIMITS.CTL	
Z		X		N/A	PID ADV TUNING.CTL	
Z		X		N/A	PID CONTROLLER.CTL	
			X		PID_CONTROLLER.CTL PID_ERROR_TOLERANCE.CTL	
Z		X		N/A		
Z		X	X	N/A	PID_INPUT_LIMITS.CTL	
Z	V	X	X	N/A	PID_TUNING.CTL	
Z	X	X		N/A	POSE2D.CTL	
Z	X	Χ		N/A	POSEWCURVATURE.CTL	
Z		X		N/A	PROFILED_PID_CONTROLLER.CTL	
Z	X	X	Χ	N/A	RAMSETE.CTL	
Z		Χ		N/A	RAMSETE_EXE_TUNING.CTL	
Z	Χ	Χ		N/A	ROTATION2D.CTL	
Ζ		Χ	X	N/A	SINGLE_JOINT_ARM_SIM.CTL	
Z	Χ	Χ		N/A	SIMPLE_MOTOR_FF.CTL	
Z		Χ		N/A	SLEW_RATE_LIMITER.CTL	
Z	X	Χ		N/A	SPLINE_CTRL_VECTOR.CTL	
Z	Χ	Χ	X	N/A	SPLINE.CTL SPLINE.CTL	
Z	Χ	Χ	X	N/A	SWERVE_DRIVE_KINEMATICS.CTL	
Z	Χ	Χ		N/A	SWERVE_DRIVE_MODULE_STATE.CTL	
Z	Χ	Χ	Χ	N/A	SWERVE_DRIVE_ODOMETRY.CTL	
Ζ			Χ	N/A	SWERVE_DRIVE_POSE_EST.CTL	
Z		Χ	X	N/A	TIMER.CTL	
Z	Χ	Χ	X	N/A	TRAJ_CONFIG.CTL	
Z	Χ	Χ	X	N/A	TRAJ_CONSTRAINT_CENTRIPETAL_ACCEL.CTL	
Z	Χ	Χ	X	N/A	TRAJ_CONSTRAINT_DIFF_DRIVE_KINEMATICS.CTL	
Z	X	Χ	X	N/A	TRAJ CONSTRAINT DIFF DRIVE VOLTAGE.CTL	
1		Χ		N/A	TRAJ CONSTRAINT JERK.CTL	Routine exists, it is just a shell
Z	Χ	Χ	Χ	N/A	TRAJ_CONSTRAINT_MECA_DRIVE_KINEMATICS.CTL	,
Z	X	Χ		N/A	TRAJ CONSTRAINT MINMAX.CTL	
Z			X		TRAJ_CONSTRAINT_SWERVE_DRIVE_KINEMATICS.CTL	
Z	X	X		N/A	TRAJ STATE.CTL	
Z	X	X		N/A	TRAJECTORY.CTL	
Z		X		N/A	TRAJECTORY SPLINE TYPE ENUM.CTL	
Z	Х	X	Х	N/A	TRANSFORM2D.CTL	
Z	\overline{X}	X		N/A	TRANSLATION2D.CTL	
Z		X		N/A	TRAPEZOID PROFILE CONSTRAINT.CTL	
Z		X	X	N/A	TRAPEZOID PROFILE STATE.CTL	
Z		X	X	N/A	TRAPEZOID_PROFILE.CTL	
Z	Х	\hat{x}		N/A	TWIST2D.CTL	
Z	^	X	X	N/A	UNSCENTED KALMAN FILTER.ctl	
Z		X	X	N/A	UNSCENTED KALMAN NEW FUNC GROUP.CTL	
Z		X	X	N/A	UNSCENTED_KALMAN_CORRECT_FUNC_GROUP.CTL UNSCENTED_KALMAN_CORRECT_FUNC_GROUP.CTL	
	V	X		N/A N/A	UTIL PATHFINDER CONFIG.CTL	
Z	X	X	X	NA NA	UTIL_PATHFINDER_CONFIG.CTL UTIL_WAYPOINT.ctl	
Z	X					Now V1 5
Z		X	Χ	NA N/A	UTIL_WEIGHTED_WAYPOINT.ctl	New V1.5
N/A		N/A	V	N/A	WAYPOINTS.CTL WEICHTED WAYPOINT CTI	Delete – obsolete
Z		X	Χ	NA N/A	WEIGHTED_WAYPOINT.CTL	New V1.5
N/A		N/A		N/A	X_Y_HEADINGS.CTL	Delete – obsolete