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...

> Menu Item VI / CTL Totals
> VI Total (X)
> CTL Total (Z)
> VI Shell Total (/)
> VI Shell Total (/)
>
> VI Total (X)
> CTL Total (Z)
> VI Shell Total (/)
>
> STEL Class Total (/)
>
> The Class Total (/) CTRL Shell Total (\) 2

Doc completed Pct 88.44% Optimization Pct 42.34%

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

'======== BASE

'=========

									,	
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
LINEAR FILTER		X		X	SI			LinearFilter Calculate.vi	71	
	Χ	X	Χ	X	Χ			LinearFilter_CutoffFrequency.vi		
	Χ	Χ	Χ	X	I		Χ	LinearFilter_Execute.vi		Labview style helper
	Χ	X		X	Χ			LinearFilter_HighPass.vi		
	Χ	X	Χ	Χ	Χ			LinearFilter_HighPassBW1.vi		
	Χ	Χ	Χ	Χ	Χ			LinearFilter_HighPassBW2.vi		
	Χ	Χ	Χ	Χ				LinearFilter_LowPassBW1.vi		
	Χ	Χ	Χ	Χ	Χ			LinearFilter_LowPassBW2.vi		
	Χ	Χ		Χ	Χ			LinearFilter_MovingAverage.vi		
	X	Χ		X	I			LinearFilter_New.vi		
	Χ	Χ		X	SI			LinearFilter_Reset.vi		
	Χ	Χ	Χ	X	SI			LinearFilter_ResetToValue.vi		
	Χ	Χ		X	Χ			LinearFilter_SinglePoleIIR.vi		
	Χ	Χ	X	X	X			LinearFilter_TimeConst.vi		
MEDIAN EU TED	Implemented	Documented	Not WPILIB	Menu Item	Kecution Optimized	Test Routine			Function Prototype	Notes
MEDIAN FILTER		X		X	Χ			MedianFilter_Calculate.vi		
	Χ	Χ	X	X	1			MedianFilter_Execute.vi		Labview style helper
	Χ	Χ		X	SI			MedianFilter_New.vi		
	Χ	Χ		X	SI			MedianFilter_Reset.vi		
	Χ	Χ	X	X	SI			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.	
			p e	

	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 Optimiz	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TIMER	Χ	X	X	X				Timer_Close.vi		releases semaphore
	Χ	X		X			X	Timer_Get.vi		·
	Χ	X	X	X				Timer_GetAndReset.vi		
	Χ	X	X	No				Timer_GetInternal.vi		Internal (private) only
	Χ	X		X			Χ	Timer_HasPeriodPassed.vi		
	Χ	X	X	X				Timer_HasPeriodPassedOnce.vi		
	Χ	X		X			Χ	Timer_New.vi		
	Χ	X		X			X	Timer_Reset.vi		
	Χ	X	X	No				Timer_ResetInternal		Internal (private) only
	Χ	X		X				Timer_Start.vi		
	Χ	X		X				Timer_Stop.vi		
	Χ	X	X	No				Timer_StopInternal.vi		Internal (private) only

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

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ARM FF	< Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimizec	Test Routine	W VI Name  ArmFF Calculate.vi	Function Prototype	Notes
AKWIFF									
	X	Χ		Χ			ArmFF_CalculateVelocityOnly.vi		
			Χ				ArmFF_Execute.vi		LabVIEW style single call
			Χ				ArmFF_ExecuteVelocityOnly.vi		LabVIEW style single call
	X	X		X			ArmFF_MaxAchieveAccel.vi		
	X	X		X			ArmFF_MaxAchieveVelocity.vi		
	X	X		X			ArmFF_MinAchieveAccel.vi		
	Χ	X		Χ			ArmFF_MinAchieveVelocity.vi		
	Χ	X		Χ			ArmFF_New_ZeroGravity.vi		
	Χ	Χ		Χ			ArmFF New.vi		

orary – VI Implementation	n List	t							
e Space Items – (This list is s	still mi	issing	one \	√I)		ed ad	ditional columns for test and sample.		
					Execution Optimized				
					imi		E a		
	þ	þ	m		b	g	Sample Program		
	nte	nte	7	H	u (	utir	A T		
	Implementea	Documented	Not WPILIB	Menu Item	utic	Test Routine	9/c		
	gld	noc	) t V	ne	ec	st	ATT		
			_≥_	Ž				Function Prototype	Notes
CONTROLLER UTIL	X	X		X	SI		ControllerUtil_GetModulusError.vi		This was short lived in WPILIB, but
									still useful here.
					75				
					Execution Optimized				
					ţį		a W		
	pa	ğ	m		Ô	ЭС	) BC		
	ent	inte	-	em	20	ίţ	ά .		
	Implementea	Documentea	Not WPILIB	Menu Item	uti	Test Routine	Sample Program		
	βdι	ಬ	01	en	ξec	est.	<u> </u>		
				Z	Ű	<u> </u>		Function Prototype	Notes
ELEV FF		X		X			ElevFF_Calculate.vi		
	X	Χ	V	Χ			ElevFF_CalculateVelocityOnly.vi ElevFF Execute.vi		LabVIEW style single call
			X				ElevFF_Execute.vi ElevFF_ExecuteVelocityOnly.vi		LabVIEW style single call
	Х	Х	^	Χ			ElevFF MaxAchieveAccel.vi		Labview style single call
	X	X		X			ElevFF MaxAchieveVelocity.vi		
	X	X		X			ElevFF_MinAchieveAccel.vi		
	X	X		X			ElevFF_MinAchieveVelocity.vi		
	X	Χ		Χ			ElevFF_New_ZeroAccel.vi		
	X	Χ		Χ			ElevFF_New.vi		
					eq				
					Мį		<u> </u>		
	Ø	Ø			)pti	(D)	gre		
	nte	ıte	18	E	0	ıţi	Program		
	иe	леі	<u>ď</u>	lte	ıtio	306	9		
	Implementea	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample VI Name		
		ρo	No		Ex	7e	<sup>®</sup> VI Name	Function Prototype	Notes
HOL_DRV_CTRL	Χ	Χ		Χ			HolDrvCtrl_AtReference.vi		Added 1/26/21
	X	Χ		X			HolDrvCtrl_Calculate_Trajectory.vi		Added 1/26/21
	Χ	Χ		X			HolDrvCtrl_Calculate.vi		Added 1/26/21
			X				HolDrvCtrl_Execute_Trajectory.vi		Future
			X				HolDrvCtrl_Execute.vi		Future
		X		X			HolDrvCtrl_New.vi		Added 1/26/21
	X	X		X			HolDrvCtrl_SetEnabled.vi HolDrvCtrl SetTolerance.vi		Added 1/26/21 Added 1/26/21
	X	Χ		Χ			HolDrvCtrl_Set   olerance.vi		Added 1/26/21
					ō				
					ize		•		
					ţi		ra L		
	pə,	eq	В	_	õ	ие	60		
	eni	ent	Ä	e.	00	uti	<u>a</u>		
	em	Ĕ	Ŋ	u II	χţ	Æ	e) di		
	Implementea	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes
PID CONTROLLER		Q	_ <u> </u>	X	Ш		PIDController_AdvCalculate_FF_Sp_Pv_Per.vi	Function Prototype	Advanced PID
PID CONTROLLER		X		X			PIDController_AdvCalculate_FF_Sp_Fv_Fel.vi		Advanced PID
	X	X	X	X			X PIDController_AdvExecute.vi		Labview style helper. Advanced
	^	^	^	^			. ISSOIII OIIOI_/IGVEXCOULO.VI		PID
	Χ	Χ		Χ			PIDController_AtSetpoint.vi		
	X	Χ		Χ			PIDController_Calculate_PV.vi		
	X	Χ		Χ			PIDController_Calculate_SP_PV.vi		
		Χ		Χ			PIDController_DisableContinousInput.vi		
	Χ	Χ		X			PIDController_EnableContinousInput.vi		
	Χ	Χ	Χ	Χ			X PIDController_Execute.vi		Labview style helper
							DIDController CetContinuousError vi	1	IORSOLETE Pamoved
	W	Χ		Χ			PIDController_GetContinuousError.vi PIDController GetPeriod.vi		OBSOLETE – Removed

s still m	issing	one '	VI)	) Add	ed additional columns for test and sample.	
X	X		Χ		PIDController_GetPID.vi	
X	X		X		PIDController_GetPositionError.vi	
X	X		X		PIDController_GetSetpoint.vi	
X	Χ		X		PIDController_GetVelocityError.vi	
X	X		X		PIDController_IsContinuousInputEnabled.vi	
X	X		X		PIDController_New.vi	
X	X		X		PIDController_NewPeriod.vi	
X	X	X	X	SI	PIDController_Pack_AdvLimits.vi	
X	Χ	X	X	SI	PIDController_Pack_AdvTuning.vi	
X	Χ	X	X	SI	PIDController_Pack_ErrorTolerance.vi	
X	Χ	X	X	SI	PIDController_Pack_InputLimits.vi	
X	X	X	X	SI	PIDController_Pack_Tuning.vi	
X	X		X		PIDController_Reset.vi	
X	X		X		PIDController_SetD.vi	
X	X	X	X		PIDController_SetDerivativeFilter.vi	Advanced PID
X	X	X	No		PIDController_SetFeedForward_OBSOLETE_DELETE.vi	Advanced PID, Obsolete –
						DELETE
X	X	X	No		PIDController_SetFFGain_OBSOLETE_DELETE.vi	Advanced PID, Obsolete – DELETE
X	X		Х		PIDController Setl.vi	DELETE
^	^		^		PIDController_SetInputRange.vi	OBSOLETE – Removed
Х	Х		Х		PIDController_SetIntegratorRange.vi	OBCOLL TE TREMOVED
X	X	X	X		PIDController SetOutputLimits.vi	Advanced PID
X	X		X		PIDController SetP.vi	/ dvariour 15
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	
X	X		X		PIDController_SetTolerance.vi	
X	X		X		PIDController SetTolerancePandV.vi	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name Function Prototype	Notes
PROFILED PID CONTROLLER	$\mathbf{R}[X]$			X		T		ProfiledPIDController AtGoal.vi	
	X	Χ		Х				ProfiledPIDController AtSetpoint.vi	
	X	Χ		X				ProfiledPIDController_Calculate_Meas_Goal.vi	
	X	Χ		Х				ProfiledPIDController Calculate Meas StateGoal TrapCnsrt.vi	
	X	Χ		X				ProfiledPIDController Calculate Meas StateGoal.vi	
	X	Χ		X				ProfiledPIDController Calculate Meas.vi	
	Χ	Χ		X				ProfiledPIDController_DisableContInput.vi	
	Χ	Χ		X				ProfiledPIDController_EnableContInput.vi	
	Χ	Χ		X				ProfiledPIDController_GetGoal.vi	
	Χ	Χ		Χ				ProfiledPIDController_GetPeriod.vi	
	Χ	Χ	X	Χ				ProfiledPIDController_GetPID.vi	WPILIB has separate getters.
	X	Χ		Χ				ProfiledPIDController_GetPositionError.vi	
	X	Χ		X				ProfiledPIDController_GetSetpoint.vi	
	X	Χ		X				ProfiledPIDController_GetVelocityError.vi	
	X	Χ		Χ				ProfiledPIDController_New.vi	
	X	X		X				ProfiledPIDController_NewPeriod.vi	
	Χ	Χ		Χ		-		ProfiledPIDController_Reset_PosOnly.vi	
	X	Χ		X				ProfiledPIDController_Reset_PosVel.vi	
	X	Χ		X				ProfiledPIDController_Reset.vi	
	X	X		X				ProfiledPIDController_SetConstraints.vi	
	X	X		X				ProfiledPIDController_SetGoal_PosOnly.vi	
	X	X		X		-		ProfiledPIDController_SetGoal.vi	
	X	X				-		ProfiledPIDController_SetIntegratorRange.vi	
	X	X		X		-		ProfiledPIDController_SetPID.vi	
	X	X		X		+		ProfiledPIDController_SetTolerance_PosOnly.vi ProfiledPIDController_SetTolerance_PosVel.vi	
	X	Χ		_ X				ProlitedPiDController_Setrolerance_Posvet.vi	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program  Manual IV	Function Prototype	Notes
/ISETE[	Χ	X		Χ	SI		Ramsete_AtReference.vi	AtReference	
	X	Χ		X	X		Ramsete_Calculate_Trajectory.vi	calculate_trajectory	
	X	X		X	X		Ramsete_Calculate.vi	calculate	
	X	X	X	X	X		Ramsete_Diff_DO_Eng.vi		
	X	X	X	X	X		Ramsete_Diff_DO_SI.vi		
	Χ		Χ	X			Ramsete_Execute_ENG.vi	Use this one!!	
	Χ		Χ	X			Ramsete_Execute_PackTuning_ENG.vi		
	Χ		Χ	X			Ramsete_Execute_PackTuning.vi		
	Χ		Χ	X			Ramsete_Execute.vi		
	Χ	X		X	SI		Ramsete_New_B_Z.vi	new(b, zeta)	
	Χ	X		Χ	SI		Ramsete_New.vi	new	
	Χ	X		X	SI		Ramsete_SetEnabled.vi	SetEnabled	
	Χ	X		X	SI		Ramsete_SetTolerance.vi	SetTolerance	
	Χ	X		Χ	X		Ramsete SINC.vi	sinc	internal

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimiz	Test Routine	VI Name	Function Prototype	Notes
SIMPLE MOTOR FEEDFORWARD	Χ			X			SimpleMotorFF_Calculate_NextV_Dt.vi		
	Χ	X		Χ	SI		SimpleMotorFF_Calculate.vi	public double calculate(double velocity, double acceleration)	
	Χ	X		Χ	SI		SimpleMotorFF_CalculateVelocityOnly.vi	public double calculate(double velocity)	
			Χ				SimpleMotorFF_Execute.vi		LabVIEW style single call
			Χ				SimpleMotorFF_ExecuteVelocityOnly.vi		LabVIEW style single call
	X	X		X	X		SimpleMotorFF_MaxAchieveAccel.vi	<pre>public double maxAchievableAcceleration(double maxVoltage, double velocity)</pre>	
	X	X		X	X		SimpleMotorFF_MaxAchieveVel.vi	public double maxAchievableVelocity(double maxVoltage, double acceleration)	
	X	X		X	X		SimpleMotorFF_MinAchieveAccel.vi	public double minAchievableAcceleration(double maxVoltage, double velocity)	
	X	X		X	X		SimpleMotorFF_MinAchieveVel.vi	public double minAchievableVelocity(double maxVoltage, double acceleration)	
	X	X		X	SI		SimpleMotorFF_New.vi	public SimpleMotorFeedforward(double ks, double kv, double ka)	
								public SimpleMotorFeedforward(double ks, double kv)	

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	lest Koutine Sample Program		Function Prototype	Notes
POSE	X	X		X	SI		Pose_Equals.VI	boolean equals( other obj )	
	Χ	Χ		Χ	X		Pose_Exp.vi	pose2d exp( twist2d twist )	
	X	Χ		Χ	SI		Pose_getRotation.vi	rotation2d getRotation()	can also use cluster unpack
	X	Χ		Χ	SI		Pose_getTranslation.vi	translation2d getTranslation()	can also use cluster unpack
	Χ	Χ	Χ	Χ	SI		Pose_getXY.vi		
	Χ	Χ	Χ	Χ	SI		Pose_getXYAngle.vi		
	Χ	Χ		Χ	X		Pose_Log.vi	twist2d log( pose2d end )	

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Revision 2.X	11/12/2021 -	– State Spa	ace Items ·	– (This list is still missing one VL) Added additional columns for test and sample.
DEVISION Z.A	1 1/1////// 1 -	- ରାଧାର ରଠ	ace nems.	– CHIIS IISEIS SIII HIISSING OHE VIL AGGEG AGGIIIGHAI COIGHIIS IOLIESI ANG SAHIDIE.

`	X	X		X	SI			Pose_Minus.vi	transform2d minus( pose2d other )	
	X	X		X	SI			Pose New TRRO.vi	pose2d new( translation2d, rotation2d )	
	X	X		X	SI			Pose New.vi	pose2d new( double x, double y, rotation2d )	
	X	X		X	SI			Pose Plus.vi	pose2d plus( transform2d other )	
	$\overline{X}$	X		X	SI			Pose RelativeTo.vi	pose2d relativeto( pose2d other )	
	$\frac{\lambda}{X}$	X		$\frac{\lambda}{X}$	SI			Pose_TransformBy.vi	pose2d transformby( transform2d other )	
	^	^		^	SI			Pose_Hansioniby.vi		
									pose2d new( )	can use cluster constant
ROTATION	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 X X X X X X X X X X X X X X X X X X	S   S   S   S   S   S   S   S   S   S	Test Routine	Sample Program	Rotation_CreateAngle.vi Rotation_CreateAngleDegrees.vi Rotation_CreateXY.vi Rotation_Equals.vi Rotation_GetAngleCosSin.vi Rotation_GetCos.VI Rotation_GetDegrees.VI  Rotation_GetRadians.VI Rotation_GetSin.VI Rotation_GetSin.VI Rotation_GetTan.VI Rotation_Hinus.vi Rotation_Plus.vi Rotation_RotateBy.vi Rotation_Times.vi	Function Prototype rotation2d new( double value ) rotation2d fromDegrees( double degrees ) rotation2d new( double x, double y ) boolean equals( rotation2d other )  double getCos() double getDegrees()  double getRadians() double getSin() double getTan() rotation2d minus( rotation2d other ) rotation2d plus( rotation2d other ) rotation2d rotateby( rotation2d other ) rotation2d times( double scalar )	Notes  convert to radians then create  New 1/26/21 use cluster unpack use cluster unpack, then convert to degree use cluster unpack use cluster unpack can calculate
	X	X		X	SI			Rotation UnaryMinus.vi	rotation2d unaryminus( )	
					O,			Trotation_onarywinac.vi	rotation2d and ymmas( )	can use cluster constant
					pə				Totation2d new()	can use duster constant
TRANSFORM	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 X X X X X X X X X X X X X X X X X X	SI SI SI SI	Test Routine	Sample Program	VI Name Transform_Create_PosePose.vi Transform_Create_TransRot.vi Transform_Equals.VI Transform_GetRotation.VI Transform_GetTranslation.VI Transform_GetXY.vi Transform_GetXYAngle.vi Transform_Inverse.vi Transform_Times.vi	Function Prototype  transform2d new( pose2d, pose2d )  transform2d new( translation2d, rotation2d )  boolean equals( other transform2d )  rotation2d getRotation()  translation2d getTranslation()  transform inverse()  transform2d times( double scalar )	Notes  use cluster unpack use cluster unpack new
TRANSFORM	X X X X X X X	X X X X X X X	X	X X X X X X X	IS IS Execution	Test Routine	Sample Program	Transform_Create_PosePose.vi Transform_Create_TransRot.vi Transform_Equals.VI Transform_GetRotation.VI Transform_GetTranslation.VI Transform_GetXY.vi Transform_GetXYAngle.vi Transform_Inverse.vi	Function Prototype  transform2d new( pose2d, pose2d )  transform2d new( translation2d, rotation2d )  boolean equals( other transform2d )  rotation2d getRotation()  translation2d getTranslation()	Notes  use cluster unpack use cluster unpack
TRANSFORM	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	X X X X X X X X X X X X X X X X X X X		Test Routine	Sample Program	Transform_Create_PosePose.vi Transform_Create_TransRot.vi Transform_Equals.VI Transform_GetRotation.VI Transform_GetTranslation.VI Transform_GetXY.vi Transform_GetXYAngle.vi Transform_Inverse.vi Transform_Times.vi  VI Name Translation_Create_DistAng.vi Translation_Create.vi	Function Prototype  transform2d new( pose2d, pose2d )  transform2d new( translation2d, rotation2d )  boolean equals( other transform2d )  rotation2d getRotation()  translation2d getTranslation()  transform inverse()  transform2d times( double scalar )  transform2d new( )	Notes  use cluster unpack use cluster unpack new
	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	X X X X X X X X X X X X X X X X X X X				Transform_Create_PosePose.vi Transform_Create_TransRot.vi Transform_Equals.VI Transform_GetRotation.VI Transform_GetTranslation.VI Transform_GetXY.vi Transform_GetXYAngle.vi Transform_Inverse.vi Transform_Times.vi  VI Name Translation_Create_DistAng.vi Translation_Create.vi Translation_Equals.vi	Function Prototype  transform2d new( pose2d, pose2d )  transform2d new( translation2d, rotation2d )  boolean equals( other transform2d )  rotation2d getRotation()  translation2d getTranslation()  transform inverse()  transform2d times( double scalar )  transform2d new( )	Notes  use cluster unpack use cluster unpack new can use cluster constant
	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 X X X X X X X X X X X X X X X X X X		Test Routine		Transform_Create_PosePose.vi Transform_Create_TransRot.vi Transform_Equals.VI Transform_GetRotation.VI Transform_GetTranslation.VI Transform_GetXY.vi Transform_GetXYAngle.vi Transform_Inverse.vi Transform_Times.vi  VI Name Translation_Create_DistAng.vi Translation_Create.vi	Function Prototype  transform2d new( pose2d, pose2d )  transform2d new( translation2d, rotation2d )  boolean equals( other transform2d )  rotation2d getRotation()  translation2d getTranslation()  transform inverse()  transform2d times( double scalar )  transform2d new( )	Notes  use cluster unpack use cluster unpack new can use cluster constant

FRC LabVIEW Trajectory Library – VI Implementat Revision 2.X 11/12/2021 – State Space Items – (This list in	on Lis	it		\	امما مماما	مانانام	Last was for tast and sample		
Revision 2.A 11/12/2021 – State Space Items – (This list)	X			···) Add			Il columns for test and sample. ranslation_GetX.VI	double getX()	can use cluster unpack
	X		XX	K SI			ranslation_GetXY.VI	double geba()	can use cluster unpack
	X			( SI				double getY()	can use cluster unpack
	X			( SI				translation2d minus( translation2d other )	·
	X			⟨ SI		Т		translation2d plus( translation2d other )	
	X	X		( SI		Т	ranslation_RotateBy.vi	translation2d rotateBy( rotation2d other )	
	X			( SI				translation2d times( double scalar )	
	X	X		( SI		Т		translation2d unaryminus( )	
									can use cluster constant
								translation2d div( double scalar )	can multiply by 1/scalar
TW!	X X X Implemented	X		( SI	Test Routine	T	wist_Create.vi	Function Prototype twist new( x, y, theta ) boolean equals( obj other )	Notes
KINEMATICS '=======				<i>9</i> <b>q</b>					
CHASSIS SPEEI		X	X Not WPILIB	( SI	Test Routine	C	hassisSpeeds_FromFieldRelativeSpeeds.VI	Function Prototype chassisspeeds fromFieldRelativeSpeeds( double x, double y, double angvel, rotation2d robotangle )	Notes
	X			C SI			hassisSPeeds_GetXYOmega.vi hassisSpeeds_New.vi	chassisspeeds new ( double xvel, double yvel, double angvel )	
	^			\ 31					can use cluster constant
DIFFERENTIAL DRIVE KINEMATIO	$\times$ Implemented		Not WPILIB		X Test Routine			Function Prototype diffDriveKine new( double trackWidth )	Notes
	X			<i>X</i>	X			chassisSpeeds toChassisSpeeds( diffDrWheelSpeeds )	
		X		( SI				diffDriveWheelSpeed toWheelSpeeds( chassisSpeeds )	
	Implemented	Documented	Not WPILIB	Execution Optimized	Test Routine			Function Prototype	Notes
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1/12/2021 - State Space Items - (This list is s										
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121 – State Space items – (This list is s										
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SWERVE DRIVE KINEMATICS		X	X	X				SwerveKinematics_New4.VI		For 4 module drives
	X	X		X				SwerveKinematics_NewX.VI		uses array as input
	X	X	X	X				SwerveKinematics_NormalizeWheelSpeeds.vi	public static void normalizeWheelSpeeds(SwerveModuleState[]	
								Companya Minamastica, Ta Chanaia Chanada 4 M	moduleStates, double attainableMaxSpeedMetersPerSecond)	For A mondate drives
	X	X	X	X				SwerveKinematics_ToChassisSpeeds4.VI SwerveKinematics ToChassisSpeedsX.VI		For 4 module drives
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									Translation2d centerOfRotationMeters)	
	X	X		X				SwerveKinematics_ToSwerveModuleStatesZeroCenter.VI	public SwerveModuleState[]	
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									public SwerveDriveKinematics(Translation2d wheelsMeters)	variable parameters (replace with
										array and "4" calls)
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SWERVE DRIVE ODOMETRY			2		Ü	7		SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics,	Notes
SWERVE DRIVE ODOMETRY	X	X	2	X	Û)	7		SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose)	Notes
SWERVE DRIVE ODOMETRY	X	X	2	X	Ш́	7 7		SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics,	Notes
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SWERVE DRIVE ODOMETRY	X X X	X X X		X X X	Ÿ	76		SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI SwerveOdometry_NewZeroCenter.VI SwerveOdometry_ResetPosition.VI	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics,	
SWERVE DRIVE ODOMETRY	X X X X	X X X	X	X X X X	Ü	76		SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI  SwerveOdometry_NewZeroCenter.VI  SwerveOdometry_ResetPosition.VI SwerveOdometry_Update4.VI	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle)	For 4 module drives
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SWERVE DRIVE ODOMETRY	X X X X X X	X X X X X X	X X X	X X X X X X	u u	7		SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI  SwerveOdometry_NewZeroCenter.VI SwerveOdometry_ResetPosition.VI SwerveOdometry_Update4.VI SwerveOdometry_UpdateWithTime4.VI SwerveOdometry_UpdateWithTimeX.VI	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)  public Pose2d updateWithTime(double currentTimeSeconds,	For 4 module drives For 4 module drives uses array as input uses array as input variable parameters (replace with
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SWERVE DRIVE ODOMETRY	X X X X X X	X X X X X X	X X X	X X X X X X	ų į	76		SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI  SwerveOdometry_NewZeroCenter.VI SwerveOdometry_ResetPosition.VI SwerveOdometry_Update4.VI SwerveOdometry_UpdateWithTime4.VI SwerveOdometry_UpdateWithTimeX.VI	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)  public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle,	For 4 module drives For 4 module drives uses array as input uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with
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SWERVE DRIVE ODOMETRY	X X X X X X	X X X X X X	X X X	X X X X X X		7.		SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI  SwerveOdometry_NewZeroCenter.VI SwerveOdometry_ResetPosition.VI SwerveOdometry_Update4.VI SwerveOdometry_UpdateWithTime4.VI SwerveOdometry_UpdateWithTimeX.VI	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)  public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle,	For 4 module drives For 4 module drives uses array as input uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with
SWERVE DRIVE ODOMETRY	X X X X X X	X X X X X X	X X X	X X X X X X			am	SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI  SwerveOdometry_NewZeroCenter.VI SwerveOdometry_ResetPosition.VI SwerveOdometry_Update4.VI SwerveOdometry_UpdateWithTime4.VI SwerveOdometry_UpdateWithTimeX.VI	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)  public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle,	For 4 module drives For 4 module drives uses array as input uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with
SWERVE DRIVE ODOMETRY	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	Optimized		am	SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI  SwerveOdometry_NewZeroCenter.VI SwerveOdometry_ResetPosition.VI SwerveOdometry_Update4.VI SwerveOdometry_UpdateWithTime4.VI SwerveOdometry_UpdateWithTimeX.VI	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)  public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle,	For 4 module drives For 4 module drives uses array as input uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with
SWERVE DRIVE ODOMETRY	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	Optimized		Program	SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI  SwerveOdometry_NewZeroCenter.VI SwerveOdometry_ResetPosition.VI SwerveOdometry_Update4.VI SwerveOdometry_UpdateWithTime4.VI SwerveOdometry_UpdateWithTimeX.VI	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)  public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle,	For 4 module drives For 4 module drives uses array as input uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with
SWERVE DRIVE ODOMETRY	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	Optimized		Program	SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI  SwerveOdometry_NewZeroCenter.VI SwerveOdometry_ResetPosition.VI SwerveOdometry_Update4.VI SwerveOdometry_UpdateWithTime4.VI SwerveOdometry_UpdateWithTimeX.VI	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)  public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle,	For 4 module drives For 4 module drives uses array as input uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with
SWERVE DRIVE ODOMETRY	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	Optimized		Program	SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI  SwerveOdometry_NewZeroCenter.VI  SwerveOdometry_ResetPosition.VI SwerveOdometry_Update4.VI SwerveOdometry_UpdateWithTime4.VI SwerveOdometry_UpdateWithTimeX.VI SwerveOdometry_UpdateX.VI	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)  public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, SwerveModuleStates)	For 4 module drives For 4 module drives uses array as input uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with array and "4" calls)
	X	Documented X X X X X X X X X X X X X X X X X X X	X X X X	Wenu Item	Execution Optimized	Test Routine 76	Sample Program	SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI  SwerveOdometry_NewZeroCenter.VI SwerveOdometry_ResetPosition.VI SwerveOdometry_Update4.VI SwerveOdometry_UpdateWithTime4.VI SwerveOdometry_UpdateWithTimeX.VI SwerveOdometry_UpdateX.VI  SwerveOdometry_UpdateX.VI	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)  public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, SwerveModuleStates)  public Pose2d update(Rotation2d gyroAngle, SwerveModuleStates)	For 4 module drives For 4 module drives uses array as input uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with
SWERVE DRIVE MODULE STATE	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X X X X X X	X X X X X X X X X X X X X X X X X X X	9 Execution Optimized		Sample Program	SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI  SwerveOdometry_NewZeroCenter.VI  SwerveOdometry_ResetPosition.VI SwerveOdometry_Update4.VI SwerveOdometry_UpdateWithTime4.VI SwerveOdometry_UpdateWithTimeX.VI SwerveOdometry_UpdateX.VI  SwerveOdometry_UpdateX.VI  VI Name SwerveModuleState_CompareTo.vi	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)  public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, SwerveModuleStates)  public Pose2d update(Rotation2d gyroAngle, SwerveModuleStates)  public Pose2d update(Rotation2d gyroAngle, SwerveModuleStates)	For 4 module drives For 4 module drives uses array as input uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with array and "4" calls)
	X	Documented 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	Wenu Item	Execution Optimized		Sample Program	SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI  SwerveOdometry_NewZeroCenter.VI SwerveOdometry_ResetPosition.VI SwerveOdometry_Update4.VI SwerveOdometry_UpdateWithTime4.VI SwerveOdometry_UpdateWithTimeX.VI SwerveOdometry_UpdateX.VI  SwerveOdometry_UpdateX.VI	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)  public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, SwerveModuleStates)  public Pose2d update(Rotation2d gyroAngle, SwerveModuleStates)  public Pose2d update(Rotation2d gyroAngle, SwerveModuleStates)	For 4 module drives For 4 module drives uses array as input uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with array and "4" calls)
	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X X X X X X	X X X X X X X X X X X X X X X X X X X	9 9 Execution Optimized		Sample Program	SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI SwerveOdometry_NewZeroCenter.VI SwerveOdometry_ResetPosition.VI SwerveOdometry_Update4.VI SwerveOdometry_UpdateWithTime4.VI SwerveOdometry_UpdateWithTimeX.VI SwerveOdometry_UpdateX.VI  VI Name SwerveModuleState_CompareTo.vi SwerveModuleState_New.vi	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)  public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, SwerveModuleStates) public Pose2d update(Rotation2d gyroAngle, SwerveModuleStates)  Function Prototype  public int compareTo(SwerveModuleState o) public SwerveModuleState(double speedMetersPerSecond, Rotation2d angle)	For 4 module drives For 4 module drives uses array as input uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with array and "4" calls)
	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X X X X X X	X X X X X X X X X X X X X X X X X X X	9 Execution Optimized		Sample Program	SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI  SwerveOdometry_NewZeroCenter.VI  SwerveOdometry_ResetPosition.VI SwerveOdometry_Update4.VI SwerveOdometry_UpdateWithTime4.VI SwerveOdometry_UpdateWithTimeX.VI SwerveOdometry_UpdateX.VI  SwerveOdometry_UpdateX.VI  VI Name SwerveModuleState_CompareTo.vi	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)  public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, SwerveModuleStates)  public Pose2d update(Rotation2d gyroAngle, SwerveModuleStates)  public Pose2d update(Rotation2d gyroAngle, SwerveModuleStates)	For 4 module drives For 4 module drives uses array as input uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with array and "4" calls)

'========

SPLINE

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State Space Items – (This list is s			one \	√I)	Adde	ed ad	ditior	nal columns for test and sample.		
(		g		,	Ď					
CUBIC HERMITE SPLINE	X X X Implemented	X X Documented	Not WPILIB	X X X	Execution Optimize	Test Routine		VI Name  CubicHermiteSpline_getControlVectorFromArrays.vi  CubicHermiteSpline_makeHermiteBasis.vi  CubicHermiteSpline_New.vi	Function Prototype  protected SimpleMatrix getCoefficients()  private SimpleMatrix getControlVectorFromArrays( double[] initialVector, double[] finalVector)  private SimpleMatrix makeHermiteBasis()  public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector)	Notes not needed, use cluster unpack
POSE WITH CURVATURE	X Implemented	X Documented	Not WPILIB	X Menu Item	S Execution Optimized	Test Routine		VI Name PoseWithCurve_New.vi	Function Prototype  public PoseWithCurvature(Pose2d poseMeters, double curvatureRadPerMeter)  public PoseWithCurvature()  public Pose2d poseMeters	Notes  can use cluster constant not needed, use cluster unpack
									public double curvatureRadPerMeter	not needed, use cluster unpack
QUINTIC HERMITE SPLINE	X X Implemented	X X Documented	Not WPILIB	X X Menu Item	Execution Optimized	Test Routine		VI Name  QuinticHermiteSpline_getControlVectorFromArrays.vi  QuinticHermiteSpline_makeHermiteBasis.vi  QuinticHermiteSpline_New.vi	Function Prototype  private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector)  private SimpleMatrix makeHermiteBasis()  public QuinticHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yFinalControlVector)  protected SimpleMatrix getCoefficients()	Notes  not needed, use cluster unpack
					~					
SPLINE (Abstract class)	✓ Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimizea	Test Routine		VI Name Spline_getPoint.vi	Function Prototype public PoseWithCurvature getPoint(double t)	Notes
SPLINE (ADSTRACT CIASS)	٨	٨		٨				Opinie_getronit.vi		
									Spline(int degree)	
									public static class ControlVector	
SPLINE HELPER	X Implemented	X Documented	Not WPILIB	X Menu Item	ত Execution Optimized	Test Routine		VI Name SplineHelp_GetCubicCtrlVector.vi	public ControlVector(double[] x, double[] y)  Function Prototype  private static Spline.ControlVector getCubicControlVector(double	implemented as data structure  Notes
								<del></del>	scalar, Pose2d point)	
	I								<del></del>	

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

Suni	HISSIII	y one	۷۱	) Auu	eu a	laallic	onal columns for test and sample.		
X	X		X		X		SplineHelp_GetCubicCtrlVectorsFromWayPts.vi	public static Spline.ControlVector[]	
								getCubicControlVectorsFromWaypoints( Pose2d start,	
								Translation2d[] interiorWaypoints, Pose2d end )	
X	X	X	X				SplineHelp_GetCubicCtrlVectorsFromWeightedWayPts.vi		
X	X	X	No				SplineHelp_GetCubicSpline_Calc1.vi		internal
X	X	X	No				SplineHelp_GetCubicSpline_Calc2.vi		internal
X	X	X	No				SplineHelp_GetCubicSpline_Calc3.vi		internal
X	X		X		X		SplineHelp_getCubicSplinesFromControlVectors.vi	public static CubicHermiteSpline[]	
								getCubicSplinesFromControlVectors( Spline.ControlVector start,	
								Translation2d[] waypoints, Spline.ControlVector end)	
X	X		X	SI			SplineHelp_GetQuinticCtrlVector.vi	private static Spline.ControlVector getQuinticControlVector(double	
								scalar, Pose2d point)	
X	X		X				SplineHelp_GetQuinticCtrlVectorsFromWayPts.vi	public static List <spline.controlvector></spline.controlvector>	
								getQuinticControlVectorsFromWaypoints( List <pose2d></pose2d>	
								waypoints)	
X	X	X	X				SplineHelp_GetQuinticCtrlVectorsFromWeightedWayPts.vi	,	
X	X		X				SplineHelp getQuinticSplinesFromControlVectors.vi	public static QuinticHermiteSpline[]	
								getQuinticSplinesFromControlVectors( Spline.ControlVector[]	
								controlVectors)	
X	X		No				SplineHelp_ThomasAlgorithm.vi	private static void thomasAlgorithm(double[] a, double[] b, double[]	internal
								c, double[] d, double[] solutionVector)	

Execution Optimized Sample Program Test Routine Not WPILIB Menu Item **Function Prototype** Notes SPLINE PARAMETERIZER X X SplineParam Spline T0 T1.vi public static List<PoseWithCurvature> parameterize(Spline spline, double t0, double t1) SplineParam Spline.vi public static List<PoseWithCurvature> parameterize(Spline spline) Χ SplineParam\_StackGet.vi X X X No internal X X X No SplineParam StackPop.vi internal X X X No SplineParam StackPush.vi internal

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

> **Function Prototype** Notes TRAJECTORY X X Χ Trajectory\_Concatenate.vi Χ XX boolean equals( other obj ) FUTURE Trajectory\_equals.vi Χ X SI Trajectory\_GetStates.vi public List<State> getStates() not needed, use unpack Χ X SI Trajectory GetTotalTime.vi public double getTotalTimeSeconds() not needed, use unpack XX No SI private static double lerp(double startValue, double endValue, Trajectory lerp double.vi XX No SI Trajectory\_lerp\_Pose.vi private static Pose2d lerp(Pose2d startValue, Pose2d endValue, internal double t) XX X SI Trajectory\_New\_Empty.vi X SI public Trajectory(final List<State> states) XX Trajectory New.vi XX Trajectory\_RelativeTo.vi public Trajectory relativeTo(Pose2d pose) Χ XX public State sample(double timeSeconds) Χ Trajectory Sample.vi X X X X Trajectory\_SampleReverse.vi Sample in reverse order. Negate public Trajectory transformBy(Transform2d transform) XX Trajectory TransformBy.vi Χ public Pose2d getInitialPose() can use cluster unpack, array index

pace Items – (This list is st	ill mi	ssing	one	VI		ded a	dditior	al columns for test and sample.		
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TRAJECTORY_STATE	Χ	X		X				TrajectoryState_Equals.vi	boolean equals( other obj )	
	X	X		X	SI			TrajectoryState_Interpolate.vi TrajectoryState_New.vi	State interpolate(State endValue, double i) public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State()	
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine		VI Name	Function Prototype	Notes
TRAJECTORY CONFIG	Χ	X		X	SI			TrajectoryConfig_Create.vi	public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq)	
	Χ	Χ	Χ	Χ	SI			TrajectoryConfig_setCentripetalAccel.vi	,	
	X	X		X	SI			TrajectoryConfig_setKinematicsDiffDrive.vi	public TrajectoryConfig setKinematics(DifferentialDriveKinematics kinematics)	
	Χ	X		X	SI			TrajectoryConfig_setKinematicsMecanumfDrive.vi	public TrajectoryConfig setKinematics(MecanumDriveKinematics kinematics)	
	Χ	X		X	SI			TrajectoryConfig_setKinematicsSwerveDrive.vi	public TrajectoryConfig setKinematics(SwerveDriveKinematics kinematics)	
	Χ	Χ		X	SI			TrajectoryConfig_setReversed.vi	public TrajectoryConfig setReversed(boolean reversed)	
	X	X	X	X	SI			TrajectoryConfig_setVoltageDiffDrive.vi	public TrajectoryConfig addConstraint(TrajectoryConstraint constraint)	Implemented differently, car duplicate.
									public TrajectoryConfig addConstraints(List extends TrajectoryConstraint constraints)	Implemented differently, car duplicate.
									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, car duplicate.
									public boolean isReversed()	can use cluster unpack
									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
JECTORY GENERATE	X	X		X	7			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	public static Trajectory generateTrajectory( Pose2d start, List <translation2d> interiorWaypoints, Pose2d end,</translation2d>	uses cubic splines
									TrajectoryConfig config )	

FRC LabVIEW Trajectory Library – VI Implementation Revision 2.X 11/12/2021 – State Space Items – (This list is s	ı List	t	a ono	\/I \	Addad a	dditio	nal calumna for test and comple		
Revision 2.A 11/12/2021 – State Space items – (This list is s	X			VI)	Added a	daillo	TrajectoryGenerate_Make_Quintic_CtrlVect.vi	public static Trajectory generateTrajectory( ControlVectorList	uses quintic splines
	X	X		X			TrajectoryGenerate_Make_Quintic.vi	controlVectors, TrajectoryConfig config)  public static Trajectory generateTrajectory(List <pose2d></pose2d>	uses quintic splines
	X	X		X			TrajectoryGenerate_splinePointsFromSplines.vi	waypoints, TrajectoryConfig config)  public static List <posewithcurvature> splinePointsFromSplines(Spline[] splines)</posewithcurvature>	
TRAJECTORY GENERATE (Control Vector)	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized Test Routine	Sample Program	VI Name	Function Prototype  public ControlVectorList(int initialCapacity)  public ControlVectorList()	Notes may not need, just data may not need, just data
								public ControlVectorList(Collection extends Spline.ControlVector collection)	may not need, just data
	Implemented	Documented		Menu Item	Execution Optimized Test Routine		VI Name	Function Prototype	Notes
TRAJECTORY PARAMETERIZE							TrajectoryParam_calcStuffFwd.vi		
	X	X		No No			TrajectoryParam_calcStuffRev.vi TrajectoryParam_enforceAccel.vi	private static void enforceAccelerationLimits(boolean reverse,	This routines needs to be changed
	X	X					TrajectoryParam_enforceVelocity.vi	List <trajectoryconstraint> constraints, ConstrainedState state)</trajectoryconstraint>	when new constraints are added. This routines needs to be changed when new constraints are added.
	X	X		X			TrajectoryParam_timeParam.vi	public static Trajectory timeParameterizeTrajectory( List <posewithcurvature> points. List<trajectoryconstraint> constraints, double startVelocityMetersPerSecond, double endVelocityMetersPerSecond, double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq, boolean reversed)</trajectoryconstraint></posewithcurvature>	WHEIL HEW CONSTITUTIONS are added.
TRAJECTORY PARAMETERIZE CONSTRAINED STATE	X Implemented	X Documented		X Menu Item	Execution Optimized Test Routine		VI Name ConstrainedState_New.vi	Function Prototype  ConstrainedState(PoseWithCurvature pose, double	Notes
TRAJECTORY PARAMETERIZE CONSTRAINED STATE								distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double maxAccelerationMetersPerSecondSq)	
	X	X	X	X			ConstrainedState_SetMaxAccel.vi ConstrainedState_SetMinAccel.vi		
	X		X	X			ConstrainedState SetVelAccel.vi		
	X	X	X	X			ConstrainedState_SetVelocity.vi		
	,							ConstrainedState()	
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized Test Routine	Sample Program	VI Name	Function Prototype	Notes

2.X 11/12/2021 – State Space Items – (This list is s	17	1009				T a	Tuulii		
TRAJECTORY UTIL				X	- V			TrajectoryUtil_fromPathWeaverJSON.vi public static Trajectory fromPathweaverJson(Path path)	
	X	X	X	X	X		-	TrajectoryUtil_MakeWeightedWayPoint_ENG.vi	
-	X	X	X	X	X			TrajectoryUtil_MakeWeightedWayPoint.vi  TrajectoryUtil_toPathWeaverJSON.vi public static void toPathweaverJson(Trajectory trajectory, P	ath
	\ \ \	\ \ \		*				public static void toPathweaverJson(trajectory trajectory, P	auri
								public static Trajectory deserializeTrajectory(String json)	
								public static String serializeTrajectory(Trajectory trajectory)	
					pəz				
TRAPEZOID PROFILE	K Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimiz	Test Routine	Sample Program	VI Name Function Prototype  TrapProfConstraint_New.vi	Notes
TRAI LEGIS I ROTILL	X			$\frac{x}{x}$				TrapProfile Calculate.vi	
	X	X		No				TrapProfile Direct.vi	Private, remove from menu
	X	X	X	X				TrapProfile Execute.vi	
	X	X	1	$\frac{x}{x}$				TrapProfile IsFinished.vi	
	X	X		X				TrapProfile_New_DefInitial.vi	
	X	Χ		X				TrapProfile_New.vi	
	X	X		No				TrapProfile_ShouldFlipAcceleration.vi	Private, remove from menu
	X	Χ		X				TrapProfile_TimeLeftUntil.vi	
	X	Χ		X				TrapProfile_TotalTime.vi	
	X	Χ		X				TrapProfState_Equals.vi	
	X	X		X				TrapProfState New.vi	
===== ORY CONSTRAINT =====	ρε	p			Optimized	94	ogram		
ORY CONSTRAINT	lemented	umented	WPILIB	nu Item	cution Optimized	t Routine	nple Program		
ORY CONSTRAINT	mplemented	Documented	Vot WPILIB	Wenu Item		Test Routine	Sample Program	VI Name Function Prototype	Notes
ORY CONSTRAINT	X Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine	Sample Program	CentripetalAccelConstraint_getMaxVelocity.vi public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	Notes
DRY CONSTRAINT			Not WPILIB			Test Routine	Sample Program	CentripetalAccelConstraint_getMaxVelocity.vi public double getMaxVelocityMetersPerSecond(Pose2d	Meters,
ORY CONSTRAINT	X	X	Not WPILIB	X	Execution		Sample Program	CentripetalAccelConstraint_getMaxVelocity.vi public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)  CentripetalAccelConstraint_getMinMaxAccel.vi public MinMax  getMinMaxAccelerationMetersPerSecondSq(Pose2d pose8)	Meters,
ORY CONSTRAINT =====	X	X		X	Optimized Q Execution		ram	CentripetalAccelConstraint_getMaxVelocity.vi  public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)  CentripetalAccelConstraint_getMinMaxAccel.vi  public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d posel double curvatureRadPerMeter, double velocityMetersPerSecondSq(Pose2d posel double curvatureRadPerMeter, double velocityMetersPerSecondSq(Pose2d posel double curvatureRadPerMeter)  CentripetalAccelConstraint New.vi  public CentripetalAccelerationConstraint(double	Meters, cond)
ORY CONSTRAINT =====	X	X		X	Optimized Q Execution		ram	CentripetalAccelConstraint_getMaxVelocity.vi  public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)  CentripetalAccelConstraint_getMinMaxAccel.vi  Dublic MinMax  getMinMaxAccelerationMetersPerSecondSq(Pose2d posel double curvatureRadPerMeter, double velocityMetersPerSecondSq(Pose2d posel double curvatureRadPerMeter, double velocityMetersPerSecondSq(Pose2d posel double curvatureRadPerMeter, double velocityMetersPerSecondSq(Pose2d posel double curvatureRadPerMeter)  CentripetalAccelConstraint_New.vi  Dublic CentripetalAccelerationConstraint(double maxCentripetalAccelerationMetersPerSecondSq)	Meters, (cond)  Can use cluster pack for nov
ORY CONSTRAINT =====	X X X   X   X   X   X   X   X   X   X	X	Not WPILIB Not WPILIB	X	imized Q Execution		ram	CentripetalAccelConstraint_getMaxVelocity.vi public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)  CentripetalAccelConstraint_getMinMaxAccel.vi public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d pose) double curvatureRadPerMeter, double velocityMetersPerSecondSq(Pose2d pose) double curvatureRadPerMeter, double velocityMetersPerSecondSq(Pose2d pose) double curvatureRadPerMeter, double velocityMetersPerSecondSq(Pose2d pose) public CentripetalAccelerationConstraint(double maxCentripetalAccelerationMetersPerSecondSq)  VI Name Function Prototype  DiffDriveKinematicsConstraint_getMaxVelocity.vi public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double	Meters, cond)
CENTRIPETAL ACCELERATION CONSTRAINT	X X X   X   X   X   X   X   X   X   X	X Nocumented X		Menu Item X	Optimized Q Execution		ram	CentripetalAccelConstraint_getMaxVelocity.vi public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)  CentripetalAccelConstraint_getMinMaxAccel.vi public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d posed double curvatureRadPerMeter, double velocityMetersPerSecondSq(Pose2d posed double curvatureRadPerMetersPerSecondSq(Pose2d posed doub	Notes  Notes

SwerveDriveKinematicsConstraint New.vi

## TRAJECTORY CONSTRAINT

Interface class - nothing done (not needed)

 $X \mid X$ 

X SI

FRC\_LabVIEW\_Trajectory\_Library\_Routines.xlsx

getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)

Can use cluster pack for now

Newpublic SwerveDriveKinematicsConstraint(final

SwerveDriveKinematics kinematics, double

maxSpeedMetersPerSecond)

DV CONSTRAINT (Min Mous)	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program

	_=	Ğ	Ž	S	Ú	Û	۳	ഗ്ഗ് VI Name	Function Prototype	Notes
TRAJECTORY CONSTRAINT (Min Max)	X	X		X	S	SI		Constraint_MinMax_New.vi	Constraint_MinMax_New	
	X	X		X	S	SI		Constraint MinMax NewMinMax.VI	Constraint MinMax New	

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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	VI Name	Function Prototype	Notes
UTIL	Χ	Χ	X	X	SI			Util_ApproxEqual.vi		
	Χ	Χ	X	X				Util_Array_PoseWCurv_to_XY.vi		
	Χ	Χ	X	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 should be optimized!
	Χ	Χ	X		N/A			Util_LibraryGlobals.vi		Global Variables – no block diag.
	Χ	Χ	Χ	Χ				Util_Trajectory_Absolute_To_Relative.vi		
	Χ	Χ	X	X				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	X	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	X	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_Waypoint_Eng_To_Sl.vi		
	Χ	Χ	X	X				Util_Waypoint_To_CubicInput.vi		
	Χ	Χ	X	X				Util_Waypoint_To_QuinticInput.vi		
	Χ	Χ	X	X				Util_WeightedWaypiont_Eng_To_WeightedWaypoint		
	Χ	X	X	No				Util_WeightedWayPoint_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	Not WPILIB	Menu Item	xecr	Test Routine	Nample Program	Function Prototype	Notes
CONV X X	<i>X</i>	Χ	SI		Conv_AngleDegrees_Heading.vi		

s sti	iii missing one vi) Added additional columns for test and sample.								
	Χ	Χ	X		SI		Conv_AngleRadians_Heading.vi		
	Χ	Χ	X	X	SI		Conv_Centimeters_Meters.vi		
	X	X	X	X	SI		Conv_Deg_Radians.vi		
	Χ	X	X	X	SI		Conv_Feet_Meters.vi		
	Χ	X	X	X	SI		Conv_GyroDegrees_Heading.vi		
	Χ	X	X	X	SI		Conv_Heading_AngleRadians.vi		
	Χ	Χ	X	X	SI		Conv_Inches_Meters.vi		
	X	X	X	X	SI		Conv_Kilograms_Pounds.vi		
	Χ	X	X	X	SI		Conv_Meters_Feet.vi		
	Χ	X	X	X	SI		Conv_Meters_Inches.vi		
	Χ	Χ	X	X	SI		Conv_POSE_SI_Eng.vi		
	Χ	Χ	X	X	SI		Conv_Pounds_Kilograms.vi		
	Χ	Χ	X	X	SI		Conv_Radians_Deg.vi		
	X	Χ	Χ	X	SI		Conv Yards Meters.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes
UNITS	X	Χ		X	SI		Units_DegreesToRadians.vi		
	X	Χ		X	SI		Units_FeetToMeters.vi		
	X	Χ		X	SI		Units_InchesToMeters.vi		
	X	Χ		X	SI		Units_MetersToFeet.vi		
	X	X		X	SI		Units_MetersToInches.vi		
	X	X		X	SI		Units_RadiansPerSecondToRotationsPerMinute.vi		
	Χ	Χ		Χ	SI		Units_RadiansToDegrees.vi		
	X	X		X	SI		Units RotationsPerMinuteToRadiansPerSecond.vi		

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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	VI Name F	function Prototype	Notes
PATHFINDERUTIL	X	X	Χ	Χ				PathfinderUtil_Continuous_Heading_Difference.vi		
	X	Χ	Χ	X				PathfinderUtil_OptimizeTrajectoryStates.vi		
	Χ	Χ	Χ	X				PathfinderUtil_ToTrajectory.vi		
	X	X	Χ	Χ				PathfinderUtil ToTrajectoryStates.vi		

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STATE SPACE MODEL

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

15 51111 1	ເມຣຣມາຕ	j one vi	) Added a	dultional columns for lest and sample.
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_GetVex775Pro.vi
X	X	X	SI	DCMotor_New.vi
X	Χ	X		DCMotor_PickMotor.vi

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

	X	X		X		LinearSystemId_CreateFlywheelSystem.vi		Update to use create matrix			
	X	X		X		LinearSystemId_CreateSingleJointedArmSystem.vi		Update to use create matrix			ĺ
		X		X		LinearSystemId_IdentifyDriveTrainSystem.vi		Update to use create matrix			Ī
		X		X		LinearSystemId_IdentifyPositionSystem.vi		Update to use create matrix			ĺ
	X	Χ		X		LinearSystemId_IdentifyVelocitySystem.vi		Update to use create matrix			Ī
											ĺ
'======== 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	$R \stackrel{\frown}{X}$			X		DiffDrivePoseEst AddVisionMeasurement.vi	71				
		X		X		DiffDrivePoseEst FillStateVector.vi					<u> </u>
		Χ		X		DiffDrivePoseEst GetEstimatedPosition.vi					Ī
	X			X		DiffDrivePoseEst_Kalman_F_Callback.vi					i
	X			X		DiffDrivePoseEst Kalman H Callback.vi					ĺ
	X	Χ		X		DiffDrivePoseEst New.vi					ı .
		X		X		DiffDrivePoseEst ResetPosition.vi					
		X		X		DiffDrivePoseEst SetVisionMeasurementStdDevs.vi					i
	X			X		DiffDrivePoseEst Update.vi					
		X		X		DiffDrivePoseEst UpdateWithTime.vi			+		
		X		X		DiffDrivePoseEst_VisionCorrect_Callback.vi			+		
	X			X		DiffDrivePoseEst VisionCorrect Kalman H Callback.vi			+ + + + + + + + + + + + + + + + + + + +		
	emented	Documented	WPILIB	u Item	Execution Optimized Test Routine Sample Program				Review	Program	· Checking
	γdι	200	Not 1	Menu	rec sst				3 <b>⊅</b> €	Test	Error
	<u> </u>		Ž		Exe 7ee Sa		Function Prototype	Notes	<u>ŏ</u>	74	<u>ii</u>
EXTENDED KALMAN FILTER			1	X		ExtendedKalmanFilter_Correct_OnlyUY.vi			_		<u> </u>
	<u> X</u>	X		X		ExtendedKalmanFilter_Correct.vi		Just a shell, not functional!			
FRC_LabVIEW_Trajectory_Library_Routines.xlsx											Page 18

		, ,	1
Revision 2.X	11/12/2021	- State Space Items	- (This list is still missing one VI) Added additional columns for test and sample.
REVISION Z.A	11/12/2021 -	<ul> <li>State Space Items</li> </ul>	<ul> <li>(This list is still missing one VI) Added additional columns for test and sample.</li> </ul>

o ouiii i	moomi	9 0110 \$1)	, , ,	luucu uu	ditional columns for test and sample.
X	X	X			ExtendedKalmanFilter_GetP_Single.vi
X	X	X			ExtendedKalmanFilter_GetP.vi
X	X	X			ExtendedKalmanFilter_GetXHat_Single.vi
X	X	X			ExtendedKalmanFilter_GetXHat.vi
X	X	X			ExtendedKalmanFilter_New.vi
X	Χ	X			ExtendedKalmanFilter_Predict.vi
X	X	X			ExtendedKalmanFilter_Reset.vi
X	X	X			ExtendedKalmanFilter_SetP.vi
X	Χ	X			ExtendedKalmanFilter_SetXHat_Single.vi
X	X	X			ExtendedKalmanFilter_SetXHat.vi

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimizec	Test Routine	Name Al Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILTER	Χ	Χ		X		X	KalmanFilter_Correct.vi					
	X	Χ		Χ			KalmanFilter_GetK					
	X	X		Χ			KalmanFilter_GetK_Single.vi					
	X	X		X			KalmanFilter_GetXHat					
	Χ	X		X		X	KalmanFilter_GetXHaT_Single					
	Χ	Χ		Χ		X	KalmanFilter_New.vi					
	Χ	X		Χ		X	KalmanFilter_Predict.vi					
	Χ	Χ		X			KalmanFilter_Reset.vi					
	Χ	X		Χ			KalmanFilter_SetXHat					
	Χ	Χ		X		X	KalmanFilter_SetXHat_Single					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimiz	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
KALMAN FILTER LATENCY COMPENSATOR	X	X		X			KalmanFilterLatencyComp_AddObserverState.vi					
	X	Χ		X			KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi					
	X	X		X			KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.vi					
	X	X		X			KalmanFilterLatencyComp. FindClosestMeasurement vi					

-	_								
X	X		Χ		KalmanFilterLatencyComp_FindClosestMeasurement.vi				
X	X		Χ		KalmanFilterLatencyComp_New.vi				
X	X		Χ		KalmanFllterLatencyComp_Observer_New.vi				
X	X		Χ		KalmanFilterLatencyComp_Reset.vi				
olemented	cumented	t WPILIB	nu Item	ecution Optimized st Routine	nple Program		de Review	st Program	or Checking

## SWERVE DRIVE POSE ESTIMATOR

	lmple	Оос	Not I	Men	Ехес	Test	Sam	VI Name Fur	nction Prototype	Notes	Code	Test	Errol
TOR								SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi					
	Χ	X		X				SwerveDrivePoseEst_AddVisionMeasurement.vi					
	Χ	X		X				SwerveDrivePoseEst_GetEstimatedPosition.vi					
	Χ	X		X				SwerveDrivePoseEst_Kalman_F_Callback.vi					
	X	X		X				SwerveDrivePoseEst_Kalman_H_Callback.vi					
	Χ	X		X				SwerveDrivePoseEst_New.vi					
Γ	Χ	Χ		Χ				SwerveDrivePoseEst ResetPosition.vi					

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

X	Χ	X		SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi	
X	Χ	X		SwerveDrivePoseEst_Update.vi	
X	Χ	X		SwerveDrivePoseEst_UpdateWithTime.vi	
X	Χ	X		SwerveDrivePoseEst_VisionCorrect_Callback.vi	
X	Χ	X		SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
UNSCENTED KALMAN FILTER				X			UnscentedKalmanFilter_Correct_FuncGroup.vi					
	Χ			Χ			UnscentedKalmanFilter_Correct_OnlyUY.vi					
	Χ			Χ			UnscentedKalmanFilter_Correct_OnlyUYR.vi					
	Χ			Χ			UnscentedKalmanFilter_Correct.vi					
	Χ	Χ		Χ			UnscentedKalmanFilter_GetP_Single.vi					
		Χ		X			UnscentedKalmanFilter_GetP.vi					
	Χ			X			UnscentedKalmanFilter_GetXHat_Single.vi					
	Χ	Χ		X			UnscentedKalmanFilter_GetXHat.vi					
	Χ			X			UnscentedKalmanFilter_New_Default.vi					
	Χ			X			UnscentedKalmanFilter_New_FuncGroup.vi					
	Χ			X			UnscentedKalmanFilter_New.vi					
		Χ		Χ			UnscentedKalmanFilter_Predict.vi					
	Χ	Χ		Χ			UnscentedKalmanFilter_Reset.vi					
	Χ	Χ		X			UnscentedKalmanFilter_SetP.vi					
	Χ	Χ		X			UnscentedKalmanFilter_SetXHat_Single.vi					
	Χ	Χ		X			UnscentedKalmanFilter_SetXHat.vi					
	Χ			X			UnscentedKalmanFilter_Transform.vi					

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STATE SPACE CONTROL

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	Implemented	Documented ^^ 100 to 1	Not WPILIB	Menu iterii	Execution Optimized Test Routine	Sample Program	VI Name	Functic	ion Prototype	Notes	Code Review	Test Program	Error Checking
CONTROL AFFINE PLANT INVERSION FEEDFORWARD													

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimiz	Test Routine	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
LINEAR PLANT INVERSION FEEDFORWARD	Χ	X		X			LinearPIntInvFF_Calculate_NextR.vi					
	Χ	X		X			LinearPIntInvFF_Calculate.vi					
	Χ	X		X			LinearPIntInvFF_GetR_Single.vi					
	Χ	X		X			LinearPIntInvFF_GetR.vi					
	Χ	Χ		X			LinearPIntInvFF_GetUff_Single.vi					
	Χ	Χ		X			LinearPIntInvFF_GetUff.vi					
	X	X		X			l inearPIntInvFF New Plant vi					

EW Trajectory Library – VI Implementation 11/12/2021 – State Space Items – (This list is s	till mis	sing one	VI ) Ad	ded add	tional columns for test and sample			
11/12/2021 State Space Items (11/18/18/18/	X	X	X X		LinearPIntInvFF_New.vi			I
	X	X	X		LinearPIntInvFF Reset Initial.vi			
		X	X		LinearPIntInvFF_Reset_Zero.vi			
	, ,	,	7.					
			σ				1	1
			mize					
	Ø	σ	Dpti	Φ		Š	Ē	
	mplementec	Documentec Not WPILIB	Menu Item Execution Op	Test Routine	VI Name Notes	Χie	gra	
	ие	ner /PII	Menu Item Execution (	200		Re	ğ	
	o/e	cu t N	าน	st F		qe	st F	
	Ĕ	å Š	ğ Ğ	j e	VI Name Function Prototype Notes	Š	Test	
LINEAR QUADRATIC REGULATOR		$\overline{X}$	X		LinearQuadraticRegulator Calculate NextR.vi			
	X		X		LinearQuadraticRegulator_Calculate.vi			
	X		X		LinearQuadraticRegulator GetK Single.vi NOT ORIGINAL			
	X		X	X	LinearQuadraticRegulator_GetK.vi			
	X		X		LinearQuadraticRegulator_GetR_Single.vi			
	X		X		LinearQuadraticRegulator_GetR.vi			
	X		X		LinearQuadraticRegulator_GetU_Single.vi			
		X	X		LinearQuadraticRegulator GetU.vi			
		$\frac{\lambda}{X}$	X	Х	LinearQuadraticRegulator_LatencyCompensate.vi  Routine exists, but it only has			+
	/	^	^	^	interger raise matrix to power.			
	Х	X	X		LinearQuadraticRegulator_New_ELMS.vi			
			111		LinearQuadraticRegulator_New_N.vi			
					LinearQuadraticRegulator_New_Raw.vi			$\top$
	Х	X	X	X	LinearQuadraticRegulator_New_SystemELMS.vi			
		X	X	7	LinearQuadraticRegulator_New.vi			
	X		X		LinearQuadraticRegulator_Reset.vi			+
	,,				II IDEAICUIAORAICREOUIAION RESELVI			
	pə		Optimized	92	Egg	e e	am	
	olemented		Optimized	st Routine		de Review	st Program	
	Implemented		Optimized	Test Routine		Code Review	Test Program	
LINEAR SYSTEM	X Implemented	Documented Not WPILIB	Menu Item Execution Optimized	Test Routine	VI Name  Function Prototype  Notes	Code Review	Test Program	
LINEAR SYSTEM	Χ	X Documented Not WPILIB	X Menu Item Execution Optimized	Test Routine	VI Name  Function Prototype  Notes  LinearSystem_CalculateX.vi	Code Review	Test Program	
LINEAR SYSTEM	X	X X Documented Not WPILIB	X X Menu Item Execution Optimized	Test Routine	VI Name  Function Prototype  Notes  LinearSystem_CalculateX.vi  LinearSystem_CalculateY.vi	Code Review	Test Program	
LINEAR SYSTEM	X X X	X X Documented Not WPILIB	X X Menu Item  Execution Optimized	Test Routine	VI Name  Function Prototype  Notes  LinearSystem_CalculateX.vi  LinearSystem_CalculateY.vi  LinearSystem_GetA.vi	Code Review	Test Program	
LINEAR SYSTEM	X X X	X X Documented Not WPILIB	X X X Menu Item Execution Optimized	Test Routine	VI Name  Function Prototype  Notes  LinearSystem_CalculateX.vi  LinearSystem_CalculateY.vi  LinearSystem_GetA.vi  LinearSystem_GetA.vi  LinearSystem_GetA.vi	Code Review	Test Program	
LINEAR SYSTEM	X X X X	X X Documented Not WPILIB	X X X Menu Item Execution Optimized	Test Routine	VI Name  Function Prototype  Notes  LinearSystem_CalculateX.vi  LinearSystem_CalculateY.vi  LinearSystem_GetA.vi  LinearSystem_GetA.vi  LinearSystem_GetAElement.vi  LinearSystem_GetBEIement.vi  LinearSystem_GetBEIement.vi	Code Review	Test Program	
LINEAR SYSTEM	X X X X X	X X Documented Not WPILIB	X X Menu Item Execution Optimized	Test Routine	VI Name Function Prototype Notes  LinearSystem_CalculateX.vi LinearSystem_GetA.vi LinearSystem_GetAElement.vi LinearSystem_GetBElement.vi	Code Review	Test Program	
LINEAR SYSTEM	X X X X X X	X X Not WPILIB	X X Menu Item X X X Execution Optimized	Test Routine	VI Name Function Prototype Notes LinearSystem_CalculateX.vi LinearSystem_CalculateY.vi LinearSystem_GetALivi LinearSystem_GetAElement.vi LinearSystem_GetBLivi LinearSystem_GetBElement.vi LinearSystem_GetBElement.vi LinearSystem_GetBElement.vi LinearSystem_GetBElement.vi LinearSystem_GetBElement.vi LinearSystem_GetBElement.vi	Code Review	Test Program	
LINEAR SYSTEM	X X X X X X X	X X Not WPILIB	X X Menu Item X X X Execution Optimized	Test Routine	VI Name Function Prototype Notes LinearSystem_CalculateX.vi LinearSystem_CalculateY.vi LinearSystem_GetA.vi LinearSystem_GetAElement.vi LinearSystem_GetB.vi LinearSystem_GetB.vi LinearSystem_GetB.vi LinearSystem_GetC.vi LinearSystem_GetC.vi LinearSystem_GetC.vi LinearSystem_GetC.vi LinearSystem_GetC.vi LinearSystem_GetC.vi LinearSystem_GetC.vi	Code Review	Test Program	
LINEAR SYSTEM	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 Menu Item X X X X X X X X X X X X X X X X X X X	Test Routine	VI Name  LinearSystem_CalculateX.vi  LinearSystem_CalculateY.vi  LinearSystem_GetA.vi  LinearSystem_GetA.vi  LinearSystem_GetAElement.vi  LinearSystem_GetB.vi  LinearSystem_GetBelement.vi  LinearSystem_GetBelement.vi  LinearSystem_GetCElement.vi  LinearSystem_GetCElement.vi  LinearSystem_GetCElement.vi  LinearSystem_GetCElement.vi  LinearSystem_GetCElement.vi	Code Review	Test Program	
LINEAR SYSTEM	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 Menu Item X X X X X X X X X X X X X X X X X X X	Test Routine	VI Name    LinearSystem_CalculateX.vi	Code Review	Test Program	
LINEAR SYSTEM	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 Menu Item X X X X X X X X X X X X X X X X X X X	Test Routine	VI Name  LinearSystem_CalculateX.vi  LinearSystem_CalculateY.vi  LinearSystem_GetA.vi  LinearSystem_GetA.vi  LinearSystem_GetAElement.vi  LinearSystem_GetB.vi  LinearSystem_GetBelement.vi  LinearSystem_GetBelement.vi  LinearSystem_GetCElement.vi  LinearSystem_GetCElement.vi  LinearSystem_GetCElement.vi  LinearSystem_GetCElement.vi  LinearSystem_GetCElement.vi	Code Review	Test Program	
LINEAR SYSTEM	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 Menu Item X X X X X X X X X X X X X X X X X X X	Test Routine	VI Name    LinearSystem_CalculateX.vi	Code Review	Test Program	
LINEAR SYSTEM	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 Menu Item X X X X X X X X X X X X X X X X X X X	Test Routine	VI Name    LinearSystem_CalculateX.vi	Code Review	Test Program	
LINEAR SYSTEM	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	timized  X X X X Menu Item  X X X X X X X X X X X X X X X X X X X	Test Ro	VI Name    LinearSystem_CalculateX.vi	. Code Review	Test Program	
LINEAR SYSTEM	X X X X X X X X X X	Not WPILIB	Optimized  X X X X X X X X X X X X X X X X X X X	Test Ro	VI Name  Function Prototype  Notes  LinearSystem_CalculateX.vi LinearSystem_CalculateY.vi LinearSystem_GetA.vi  LinearSystem_GetAElement.vi LinearSystem_GetB.vi LinearSystem_GetB.vi LinearSystem_GetC.vi LinearSystem_GetC.vi LinearSystem_GetClement.vi LinearSystem_GetClement.vi LinearSystem_GetD.vi LinearSystem_GetD.vi LinearSystem_GetD.vi LinearSystem_GetDelement.vi LinearSystem_GetDelement.vi LinearSystem_GetDelement.vi LinearSystem_GetDelement.vi LinearSystem_GetDelement.vi LinearSystem_New.vi	ew Code Review	ω	
LINEAR SYSTEM	X X X X X X X X X X	Not WPILIB	Optimized  X X X X X X X X X X X X X X X X X X X	Test Ro	VI Name  Function Prototype  Notes  LinearSystem_CalculateX.vi  LinearSystem_GetAvi  LinearSystem_GetAvi  LinearSystem_GetB.vi  LinearSystem_GetB.vi  LinearSystem_GetCvi  LinearSystem_GetCvi  LinearSystem_GetCvi  LinearSystem_GetCblement.vi  LinearSystem_GetDvi  LinearSystem_GetDvi  LinearSystem_GetDelement.vi  LinearSystem_GetDelement.vi  LinearSystem_GetDelement.vi  LinearSystem_GetDelement.vi  LinearSystem_SetDelement.vi  LinearSystem_New.vi	eview Code Review	ω	
LINEAR SYSTEM	X X X X X X X X X X	Not WPILIB	Optimized  X X X X X X X X X X X X X X X X X X X	Test Ro	VI Name  Function Prototype  Notes  LinearSystem_CalculateX.vi  LinearSystem_GetAvi  LinearSystem_GetAvi  LinearSystem_GetB.vi  LinearSystem_GetB.vi  LinearSystem_GetCvi  LinearSystem_GetCvi  LinearSystem_GetCvi  LinearSystem_GetCblement.vi  LinearSystem_GetDvi  LinearSystem_GetDvi  LinearSystem_GetDelement.vi  LinearSystem_GetDelement.vi  LinearSystem_GetDelement.vi  LinearSystem_GetDelement.vi  LinearSystem_SetDelement.vi  LinearSystem_New.vi	. Review Code Review	Program Test Program	
LINEAR SYSTEM	X X X X X X X X X X	Not WPILIB	Optimized  X X X X X X X X X X X X X X X X X X X	Test Ro	VI Name  Function Prototype  Notes  LinearSystem_CalculateX.vi  LinearSystem_GetAvi  LinearSystem_GetAvi  LinearSystem_GetB.vi  LinearSystem_GetB.vi  LinearSystem_GetCvi  LinearSystem_GetCvi  LinearSystem_GetCvi  LinearSystem_GetCblement.vi  LinearSystem_GetDvi  LinearSystem_GetDvi  LinearSystem_GetDelement.vi  LinearSystem_GetDelement.vi  LinearSystem_GetDelement.vi  LinearSystem_GetDelement.vi  LinearSystem_SetDelement.vi  LinearSystem_New.vi	ide Review Code Review	Program	
	Implemented 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 X Documented Not WPILIB	Menu Item  X X X X X X X X X X X X X X X X X X X	Test Ro	VI Name Function Prototype Notes  LinearSystem_CalculateX.vi LinearSystem_GetA.vi LinearSystem_GetB.vi LinearSystem_GetB.vi LinearSystem_GetB.vi LinearSystem_GetBement.vi LinearSystem_GetBement.vi LinearSystem_GetCvi LinearSystem_GetCvi LinearSystem_GetCb.vi LinearSystem_GetD.vi Li	Code Review Code Review	ω	
LINEAR SYSTEM	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 X X X X X X X X X X X X X X	X Menu Item  X X X X X X X X X X X X X X X X X X X	Test Ro	VI Name Function Prototype Notes  LinearSystem_CalculateX vi LinearSystem_GetA.vi LinearSystem_GetA.vi LinearSystem_GetB.vi LinearSystem_GetB.vi LinearSystem_GetB.vi LinearSystem_GetCElement.vi LinearSystem_GetCElement.vi LinearSystem_GetCElement.vi LinearSystem_GetCElement.vi LinearSystem_GetD.vi Line	Code Review Code Review	Program	
	Implemented 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 X X X X X X X X X X X X X X	Menu Item  X X X X X X X X X X X X X X X X X X X	Test Ro	VI Name  Function Prototype  Notes  LinearSystem CalculateX vi LinearSystem GetA vi LinearSystem GetA vi LinearSystem GetBelment.vi LinearSystem GetBelment.vi LinearSystem GetBelment.vi LinearSystem GetBelment.vi LinearSystem GetDelment.vi LinearSystem GetDelment.vi LinearSystem GetDelment.vi LinearSystem GetDelment.vi LinearSystem GetDelment.vi LinearSystem GetDelment.vi LinearSystem New.vi  Function Prototype  Notes  VI Name  Function Prototype  Notes	Code Review Code Review	Program	
	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 X X X X X X X X X X X X X X	X Menu Item  X X X X X X X X X X X X X X X X X X X	Test Ro	VI Name    Function Prototype	Code Review  Code Review	Program	
	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 X X X X X X X X X X X X X X	X Menu Item  X X X X X X X X X X X X X X X X X X X	Test Ro	VI Name  Function Prototype  Notes  LinearSystem CalculateX vi LinearSystem GetA vi LinearSystem GetA vi LinearSystem GetBelment.vi LinearSystem GetBelment.vi LinearSystem GetBelment.vi LinearSystem GetBelment.vi LinearSystem GetDelment.vi LinearSystem GetDelment.vi LinearSystem GetDelment.vi LinearSystem GetDelment.vi LinearSystem GetDelment.vi LinearSystem GetDelment.vi LinearSystem New.vi  Function Prototype  Notes  VI Name  Function Prototype  Notes	Code Review Code Review	Program	

IS SIII	missin	g one vi)	Add	ded additional columns for test and sample.		
	XX	X		LinearSystemLoop_GetError.vi		
	$X \mid X$	X		LinearSystemLoop_GetFeedForward.vi		
	XX	X		LinearSystemLoop_GetNextR_Single.vi		
	XX	X		LinearSystemLoop_GetNextR.vi		
	XX	X		LinearSystemLoop_GetObserver.vi		
	XX	X		LinearSystemLoop_GetU_Row.vi		
	XX	X		LinearSystemLoop_GetU.vi		
	X X	X		LinearSystemLoop_GetXHat_Single.vi		
	XX	X		LinearSystemLoop_GetXHat.vi		
				LinearSystemLoop_New_BBB		
				LinearSystemLoop_New_LinearSystem_ClampFunc		
	XX	X		LinearSystemLoop_New_LinearSystem_ClampVal.vi		
	XX	X		LinearSystemLoop_New.vi		
	XX	X		LinearSystemLoop_Predict.vi		
	XX	X		LinearSystemLoop_Reset.vi		
				LinearSystemLoop_SetClampFunction.vi		
				LinearSystemLoop_SetNextR_Some.vi		
	XX	X		LinearSystemLoop_SetNextR.vi		
				LinearSystemLoop_SetXHat_Single.vi		
				LinearSystemLoop_SetXHat.vi		

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

CALLBACK HELPER	X X Implemented	Documented	X X Not WPILIB	X X Menu Item		Test Bourtine	Sample Drogram	VI Name  CallbackHelp_MatrixMinus.vi  CallbackHelp_MatrixMult_CoerceSizeB.vi  CallbackHelp_MatrixMult.vi  CallbackHelp_MatrixPlus.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	nted	nted	BI-	8	n Optimized		or o				view	yram	Checking
	Implemented	Documented	Not WPILIB	Menu Item			Sample	VI Name	Function Prototype	Notes	Code Revien	Test Program	Error Che
DISCRETIZATION	X	Χ	Not WPIL	X		)		Discretization_DiscretizeA.vi	Function Prototype	Notes	Code Rei	Test Prog	Error Che
DISCRETIZATION	X	X	Not WPIL	X		<i>)</i>	(	Discretization_DiscretizeA.vi Discretization_DiscretizeAB.vi	Function Prototype	Notes	Code Rei	Test Prog	Error Che
DISCRETIZATION	X	Χ	Not WPIL	X		)	(	Discretization_DiscretizeA.vi Discretization_DiscretizeAB.vi Discretization_DiscretizeABTaylor.vi	Function Prototype	Notes	Code Rei	Test Prog	Error Che
DISCRETIZATION	X X X	X X X	Not WPII	X X X		) ) )	(	Discretization_DiscretizeA.vi Discretization_DiscretizeAB.vi Discretization_DiscretizeABTaylor.vi Discretization_DiscretizeAQ.vi	Function Prototype	Notes	Code Rei	Test Prog	Error Che
DISCRETIZATION	X X X	X X X	Not WPII	X X X		) ) )	(	Discretization_DiscretizeA.vi Discretization_DiscretizeAB.vi Discretization_DiscretizeABTaylor.vi Discretization_DiscretizeAQ.vi Discretization_DiscretizeAQTaylor.vi	Function Prototype	Notes	Code Rei	Test Prog	Error Che
DISCRETIZATION	X X X	X X X	Not WP/I	X X X		) ) )	(	Discretization_DiscretizeA.vi Discretization_DiscretizeAB.vi Discretization_DiscretizeABTaylor.vi Discretization_DiscretizeAQ.vi	Function Prototype	Notes	Code Rei	Test Prog	Error Che
DISCRETIZATION	X X X X	X X X X		X X X	Optimized	>	(	Discretization_DiscretizeA.vi  Discretization_DiscretizeAB.vi  Discretization_DiscretizeABTaylor.vi  Discretization_DiscretizeAQ.vi  Discretization_DiscretizeAQTaylor.vi  Discretization_DiscretizeR.vi			Review		Checking
	X	X X X X	Not WPILIB Not WPIL	Menu Item	Execution Optimized	>		Discretization_DiscretizeA.vi  Discretization_DiscretizeAB.vi  Discretization_DiscretizeABTaylor.vi  Discretization_DiscretizeAQ.vi  Discretization_DiscretizeAQTaylor.vi  Discretization_DiscretizeR.vi	Function Prototype	Notes		Test Program	Етог
DISCRETIZATION	X	X X X X		X X X	Execution Optimized	>	(	Discretization_DiscretizeA.vi  Discretization_DiscretizeAB.vi  Discretization_DiscretizeABTaylor.vi  Discretization_DiscretizeAQ.vi  Discretization_DiscretizeAQTaylor.vi  Discretization_DiscretizeR.vi	Function Prototype		Review		Checking

## 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.

 		,		
X	Χ	X	X	StateSpaceUtil_MakeCostMatrix.vi StateSpaceUtil_MakeCostMatrix.vi
X	Χ	X	X	StateSpaceUtil_MakeCovarianceMatrix.vi
X	X	X		StateSpaceUtil_MakeWhiteNoiseVector.vi
X	Χ	X		StateSpaceUtil_NomalizeInputVector.vi
X	Χ	X		StateSpaceUtil_PoseTo3dVector.vi
Χ	Χ	X		StateSpaceUtil_PoseTo4dVector.vi
Χ	Χ	X		StateSpaceUtil_PoseToVector.vi

'====== SIMULATION

'========

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Nample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
BATTERY SIM	I X	X		X	SI		BatterySim_CalculateDefaultBatteryLoadedVoltage.vi					
	X	X		X	SI		BatterySim_CalculateLoadedVoltage.vi					
					imized		<u>E</u>					ξ.

X Menu Item Function Prototype Notes DIFFERENTIAL DRIVE TRAIN SIM X X DiffDriveTrainSim\_ClampInput.vi Χ XX DiffDriveTrainSim\_CreateKitbotSim\_EstMass.vi XX Χ DiffDriveTrainSim CreateKitbotSim EstMassMOI.vi XX Χ DiffDriveTrainSim CreateKitbotSim.vi XX Χ DiffDriveTrainSim GetCurrentDrawAmps.vi XX Χ DiffDriveTrainSim GetCurrentGearing.vi XX Χ DiffDriveTrainSim GetDynamics.vi XX Χ DiffDriveTrainSim GetHeading.vi XX DiffDriveTrainSim GetLeftCurrentDrawAmps.vi Χ XX Χ DiffDriveTrainSim GetLeftPositionMeters.vi XX X DiffDriveTrainSim GetLeftVelocityMetersPerSecond.vi XX X DiffDriveTrainSim\_GetOutput\_Single.vi XX Χ DiffDriveTrainSim GetPose.vi XX Χ DiffDriveTrainSim\_GetRightCurrentDrawAmps.vi XX X DiffDriveTrainSim GetRightPositionMeters.vi XX X DiffDriveTrainSim\_GetRightVelocityMetersPerSecond.vi XX Χ DiffDriveTrainSim\_GetState\_Single.vi XX Χ DiffDriveTrainSim GetState.vi XX X DiffDriveTrainSim KitBotWheelSize.vi XX X DiffDriveTrainSim\_New\_Mass\_MOI.vi XX DiffDriveTrainSim\_New.vi Χ DiffDriveTrainSim\_SetCurrentGearing.vi XX Χ XX Χ DiffDriveTrainSim\_SetInputs.vi DiffDriveTrainSim SetPose.vi XX X X X Χ DiffDriveTrainSim\_SetState.vi DiffDriveTrainSim\_ToughBoxMiniGearRatio.vi XX Χ XX Χ DiffDriveTrainSim ToughBoxMiniMotor.vi XX Χ DiffDriveTrainSim Update.vi

RC LabVIEW Trajectory Library	y - vi iiripieirieirialioi ace Items - (This list is s	i LISL		<u> </u>	Added at	dditional columns for test and sample.					
VISION 2.X 11/12/2021 - State Sp	dace items – (Tilis list is s	uii iiiiss	ing one	VI) /	See Dead						
					otimi;	gram			_	4	ρ
		nted	itea IB	и	n Opti tine				<i>vi</i> ew	Test Program	Checking
		Implement	Documente Not WPILIB	Menu Item	Execution Op Test Routine	Name All Name			Revi	Prog	Che
		əldı	ocul ot N	enn	ecu sst F	d was			Code	sst F	Error
	ELEVATOR CIM				<u>û</u> µ	の VI Name	Function Prototype	Notes	<u>ŏ</u>		<u>ii</u>
	ELEVATOR SIM	X		X		ElevatorSim_GetCurrentDraw.vi ElevatorSim_GetPositionMeters.vi			+		
		X	$\frac{\hat{x}}{x}$	X		ElevatorSim_GetVelocityMetersPerSecond.vi			+		
		X	X	X		ElevatorSim_HasHitLowerLimit.vi					
		X	<u>X</u>	X		ElevatorSim_HasHitUpperLimit.vi					
	•	-	_	+		ElevatorSim_New_LinSys_NoNoise.vi ElevatorSim_New_LinSys.vi			+		
			_	+		ElevatorSim New NoNoise.vi			+		
		X		X		ElevatorSim_New.vi					
		X		No		ElevatorSim_RKF45_Func.vi					
			X X	X		ElevatorSim_SetInputVoltage.vi ElevatorSim_SetState.vi			+		
			$\frac{\lambda}{X} \times \frac{\lambda}{X}$			ElevatorSim_Update.vi		Needed because this doesn't	+		
								extend.			
		X	X	X		ElevatorSim_UpdateX.vi					
		X	<u>x</u>	X		ElevatorSim_WouldHitLowerLimit.vi ElevatorSim_WouldHitUpperLimit.vi			+		
	ļ	_^_/				ElevatorSim_vvoutdHitOpperLimit.vi					
		Implemente	Documentea Not WPILIB	Menu Item	Execution Op Test Routine	Name VI Name	Function Prototype	Notes	Code Reviev	Test Program	Error Checking
	FLYWHEEL SIM			$\overline{X}$		FlyWheelSim_GetAngularVelocityRadPerSec.vi	T directory pe	Trotos			
		X		X		FlyWheelSim_GetAngularVelocityRPM.vi					
		X	<u> </u>	X		FlyWheelSim_GetCurrentDrawAmps FlyWheelSim_New_LinSys		Future			ı
			_	+		FlyWheelSim_New_LinSys_MOI_NoNoise		Future	+		
			+	+		FlyWheelSim_New_LinSys_NoNoise		Future	+		
		X	X	X		FlyWheelSim_New_MOI.vi					
		X X	X	X		Fly M/h a al Cina Catlamy et vi					ı
		<b>X</b>   .	V	+		FlyWheelSim_SetInput.vi					
		X	$\frac{X}{X}$	X		FlyWheelSim_SetState.vi					
		X	X X	X							
		X	X X	X	pe	FlyWheelSim_SetState.vi					
		X	X   X   X	X	timized	FlyWheelSim_SetState.vi FlyWheelSim_Update.vi					9
		X	X	X	Optimized ine	FlyWheelSim_SetState.vi FlyWheelSim_Update.vi			iew	.am	cking
		X	X	X	tion Optimized outine	FlyWheelSim_SetState.vi FlyWheelSim_Update.vi			Review	rogram	Shecking
		X	X	X	ecution Optimized	FlyWheelSim_SetState.vi FlyWheelSim_Update.vi			de Review	st Program	or Checking
		X	Documented X Not WPILIB	Menu Item X	Execution Optimized Test Routine	FlyWheelSim_SetState.vi FlyWheelSim_Update.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	LINEAR SYSTEM SIM	X	Documented X Not WPILIB	X	Execution Optimized Test Routine	FlyWheelSim_SetState.vi FlyWheelSim_Update.vi	Function Prototype		Code Review	Test Program	Error Checking
	LINEAR SYSTEM SIM	X Implemented	X Documented X Not WPILIB	X Menu Item	Execution Optimized Test Routine	FlyWheelSim_SetState.vi FlyWheelSim_Update.vi  FlyWheelSim_Update.vi  VI Name  LinearSystemSim_ClampInput.vi LinearSystemSim_GetCurrentDrawAmps.vi	Function Prototype	Notes  DONT IMPLEMENT	Code Review	Test Program	Error Checking
	LINEAR SYSTEM SIM	X Implemented	X Documented X Not WPILIB	X Menu Item	Execution Optimized Test Routine	FlyWheelSim_SetState.vi FlyWheelSim_Update.vi  FlyWheelSim_Update.vi  VI Name  LinearSystemSim_ClampInput.vi LinearSystemSim_GetCurrentDrawAmps.vi LinearSystemSim_GetOutput_Single.vi	Function Prototype		Code Review	Test Program	Error Checking
	LINEAR SYSTEM SIM	X	X Not WPILIB	X Menu Item	Execution Optimized Test Routine	FlyWheelSim_SetState.vi FlyWheelSim_Update.vi  FlyWheelSim_Update.vi  VI Name  LinearSystemSim_ClampInput.vi LinearSystemSim_GetCurrentDrawAmps.vi	Function Prototype		Code Review	Test Program	Error Checking
	LINEAR SYSTEM SIM	X   X   X   X   X   X   X   X   X   X	X X Documented X X X X Not WPILIB	X Wenu Item	Execution Optimized Test Routine	FlyWheelSim_SetState.vi FlyWheelSim_Update.vi  VI Name  LinearSystemSim_ClampInput.vi LinearSystemSim_GetCurrentDrawAmps.vi LinearSystemSim_GetOutput_Single.vi LinearSystemSim_GetOutput.vi LinearSystemSim_GetOutput.vi LinearSystemSim_GetOutput.vi LinearSystemSim_New LinearSystemSim_New LinearSystemSim_New_NoNoise.vi	Function Prototype	DONT IMPLEMENT	Code Review	Test Program	Error Checking
	LINEAR SYSTEM SIM	X   X   X   X   X   X   X   X   X   X	X Documented X X X Not WPILIB	X Wenu Item	Execution Optimized Test Routine	FlyWheelSim_SetState.vi FlyWheelSim_Update.vi  VI Name  LinearSystemSim_ClampInput.vi LinearSystemSim_GetCurrentDrawAmps.vi LinearSystemSim_GetOutput_Single.vi LinearSystemSim_GetOutput.vi LinearSystemSim_GetOutput.vi LinearSystemSim_New LinearSystemSim_New LinearSystemSim_New_NoNoise.vi LinearSystemSim_SetInput_Array.vi	Function Prototype		Code Review	Test Program	Error Checking
	LINEAR SYSTEM SIM	X   X   X   X   X   X   X   X   X   X	X Documented X X X X X X X X X X X X X X X X X X X	X Wenu Item	Execution Optimized Test Routine	FlyWheelSim_SetState.vi FlyWheelSim_Update.vi  VI Name  LinearSystemSim_ClampInput.vi LinearSystemSim_GetCurrentDrawAmps.vi LinearSystemSim_GetOutput_Single.vi LinearSystemSim_GetOutput.vi LinearSystemSim_New LinearSystemSim_New LinearSystemSim_New_NoNoise.vi LinearSystemSim_SetInput_Array.vi LinearSystemSim_SetInput_Single.vi	Function Prototype	DONT IMPLEMENT	Code Review	Test Program	Error Checking
	LINEAR SYSTEM SIM	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 X X X X X X X X X X X X X X	X Wenu Item	Execution Optimized Test Routine	FlyWheelSim_SetState.vi FlyWheelSim_Update.vi  VI Name  LinearSystemSim_ClampInput.vi LinearSystemSim_GetCurrentDrawAmps.vi LinearSystemSim_GetOutput_Single.vi LinearSystemSim_GetOutput.vi LinearSystemSim_New LinearSystemSim_New LinearSystemSim_New_NoNoise.vi LinearSystemSim_SetInput_Array.vi LinearSystemSim_SetInput_Single.vi LinearSystemSim_SetInput_Single.vi LinearSystemSim_SetInput_Single.vi LinearSystemSim_SetInput_Single.vi	Function Prototype	DONT IMPLEMENT	Code Review	Test Program	Error Checking
	LINEAR SYSTEM SIM	X   X   X   X   X   X   X   X   X   X	X Documented X X X X X X X X X X X X X X X X X X X	X Wenu Item	Execution Optimized Test Routine	FlyWheelSim_SetState.vi FlyWheelSim_Update.vi  VI Name  LinearSystemSim_ClampInput.vi LinearSystemSim_GetCurrentDrawAmps.vi LinearSystemSim_GetOutput_Single.vi LinearSystemSim_GetOutput.vi LinearSystemSim_New LinearSystemSim_New LinearSystemSim_New_NoNoise.vi LinearSystemSim_SetInput_Array.vi LinearSystemSim_SetInput_Single.vi	Function Prototype	DONT IMPLEMENT	Code Review	Test Program	Error Checking

Revision 2.X 11/12/2021 – State Space items – (This list is still	i missing one vi). Added addil	ional columns for test and sample.		
	X X X No	LinearSystemSim_UpdateY.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized Test Routine	Sample Program  Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
SINGLE JOINT ARM SIM	X	Χ		Χ		SngJntArmSim_EsitmateMOI.vi					
	X	Χ		Χ		SngJntArmSim_GetAngleRads.vi					
	X	Χ		Χ		SngJntArmSim_GetCurrentDraw.vi					
	X	Χ		Χ		SngJntArmSim_GetVelocityRadsPerSec.vi					
	X	Χ		Χ		SngJntArmSim_HasHitLowerLimit.vi					
	X	Χ		Χ		SngJntArmSim_HasHitUpperLimit.vi					
	X	Χ		Χ		SngJntArmSim_New.vi					
	X	Χ		No		SngJntArmSim_Rkf45_Func.vi					
	X	X		Χ		SngJntArmSim_SetInputVoltage.vi					
	X	Χ		Χ		SngJntArmSim_SetState.vi					
	X	X		Χ		SngJntArmSim_Update.vi					
	Χ	Χ		Χ		SngJntArmSim_UpdateX.vi					
	X	Χ		Χ		SngJntArmSim_WouldHitLowerLimit.vi					
	X	Χ		Χ		SngJntArmSim_WouldHitUpperLimit.vi					

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

	Implemented Documented	Not WPILIB	Menu Item	Execution Optimized	Sample Program amen IA	Function Prototype	Notes	Code Review	Test Program	Error Checking
MAT BUILDER	X		X	SI	MatBuilder_Create.vi					
	Χ		X	SI	MatBuilder Fill.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optim	Test Routine	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATRIX	Χ	X		X	SI		Matrix_AssignBlock.vi					
	Χ	X		X	SI		Matrix_Block.vi					
	Χ	X		X	SI		Matrix_Create.vi					
	Χ	X		X	SI		Matrix_Diag.vi					
	Χ	X		X	SI		Matrix_ElementSum.vi					
	Χ	X		X	- 1		Matrix_Exp.vi					
	Χ	X		X	SI		Matrix_ExtractColumnVector.vi					
	Χ	X		X	SI		Matrix_ExtractFrom.vi					
	Χ			X	SI		Matrix_ExtractMatrix.vi					
	Χ	X		X	SI		Matrix_ExtractRowVector.vi					
	Χ	X		X	SI		Matrix_Fill.vi					
	Χ	X		X	- 1		Matrix_Ident.vi					
	Χ	X		X	SI		Matrix_IsEqual.vi					
	Χ	X		X	I		Matrix_LltDecompose.vi					
	Χ	X		X	1		Matrix_Pow.vi					
	Χ	X		X	SI		Matrix_SetColumn.vi					

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. Matrix SetRow.vi THERE ARE LOTS OF OTHER MATRIX FUNCTIONS THAT SHOULD BE INCLUDED HERE FOR ISOLATION. iple Program rest Routine **Function Prototype** VI Name Notes MATRIX HELPER X MatrixHelper CooerceSize.vi X SI X | X | X | SI | X | X | SI | MatrixHelper MultCooerceBSize.vi Χ MatrixHelper\_Zero.vi Test Routine Menu Item VI Name Function Prototype Notes VECTOR BUILDER X X VecBuilder\_1x1Fill.vi Χ SI XX X SI VecBuilder\_2x1Fill.vi SI VecBuilder\_3x1Fill.vi XX Χ XX X SI VecBuilder 4x1Fill.vi VecBuilder 5x1Fill.vi XX X SI VecBuilder 6x1Fill.vi  $X \mid X$ X SI VecBuilder 7x1Fill.vi  $X \mid X$ X SI VecBuilder 8x1Fill.vi XX X SI VecBuilder 9x1Fill.vi VecBuilder 10x1Fill.vi X X X X SI VecBuilder ArrayBy1Fill.vi '========= MATH '======== Execution Optimized Function Prototype Notes ANGLE STATISTICS X X X X X AngleStats\_AngleAdd\_CallbackHelp.vi XX X I X AngleStats\_AngleAdd.vi X X X X X AngleStats\_AngleMean\_CallbackHelp.vi AngleStats\_AngleMean.vi XX X I X X X X X X AngleStats\_AngleResidual\_CallbackHelp.vi XX AngleStats AngleResidual.vi  $X \mid I \mid X$ Execution Optimized Sample Program **Test Routine** Not WPILIB **Menu Item** 

Function Prototype

Notes

	still m	issing c	ne VI	) Ad	ded add	litional columns for test and sample.				
MATH UTILIT	<b>Y</b> X	X		X SI		MathUtil_AngleModulus.vi				
	X	X		X SI		MathUtil_ApplyDeadband.vi				
	X			X SI		MathUtil_Clamp_Int.vi				
	Χ	X		X SI		MathUtil_Clamp.vi				
	X	X		X SI		MathUtil_InputModulus.vi				
MERWE SCALED SIGMA POINTS	X X X X X	X X X X X X		X   X   Nenu Item   X   X   Si   X   X   X   Si   X   X   X   Si   X   X   X   Si   X   X   X   X   X   X   X   X   X	Test Rou	WerweScSigPts_ComputeWeights.vi MerweScSigPts_GetNumSigmas.vi MerweScSigPts_GetWc_Single.vi MerweScSigPts_GetWc.vi MerweScSigPts_GetWm_Single.vi MerweScSigPts_GetWm_Vi MerweScSigPts_GetWm.vi MerweScSigPts_GetWm.vi MerweScSigPts_New_Default.vi	Function Prototype	Notes	Code Review	Test Program
	X	X		ΧI		MerweScSigPts_New.vi				
	X	X		ΧI		MerweScSigPts_SigmaPoints.vi				
	ented	ented	ILIB	tem ion Optin	outine	. Progra			eview	ogram
	Implemented	Documented	Not WPILIB	Menu Item Execution Optii	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program
NUMERICAL INTEGRATIO		Documented		S Menu Item Execution	Test Routine	ପ୍ରଧାନ ଜଣ	Function Prototype	Notes	Code Review	Test Program
NUMERICAL INTEGRATIO	N X	Documented		os os Menu Item Execution	Test Routine	VI Name  NumIntegrate_Func_Ax_Bu_K.vi  NumIntegrate_Func_Bs.vi	Function Prototype	Notes	Code Review	Test Program
NUMERICAL INTEGRATIO	N X	Documented		os os Menu Item Execution	Test Routine	VI Name  NumIntegrate_Func_Ax_Bu_K.vi  NumIntegrate_Func_Bs.vi  NumIntegrate_Func_Ch.vi	Function Prototype	Notes	Code Review	Test Program
NUMERICAL INTEGRATIO	N X	Documented		oN oN Menu Item Execution	Test Routine	VI Name  NumIntegrate_Func_Ax_Bu_K.vi  NumIntegrate_Func_Bs.vi  NumIntegrate_Func_Ch.vi	Function Prototype	Notes	Code Review	Test Program
NUMERICAL INTEGRATIO	X X X	Documented	1	ON ON Wenu Item ON ON Wenu Item Execution	Test Routine	VI Name  NumIntegrate_Func_Ax_Bu_K.vi  NumIntegrate_Func_Bs.vi	Function Prototype	Notes NOT DONE	Code Review	Test Program
NUMERICAL INTEGRATIO	X X X	Documented	1	ON ON Wenu Item ON ON Wenu Item Execution	Test Routine	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	Test Program
NUMERICAL INTEGRATIO	X X X X / /			X No	Test Routine	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_Dbl.vi	Function Prototype		Code Review	Test Program
NUMERICAL INTEGRATIO	X X X X / /			X No	Test Routine	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_U.vi	Function Prototype	NOT DONE	Code Review	Test Program
NUMERICAL INTEGRATIO	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	Test Routine	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_U.vi NumIntegrate_Rk4_Mat_X_V.vi	Function Prototype	NOT DONE	Code Review	Test Program
NUMERICAL INTEGRATIO	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	Test Routine	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_U.vi  NumIntegrate_Rk4_Mat_X.vi  NumIntegrate_Rk4_Mat_X.vi	Function Prototype	NOT DONE	Code Review	Test Program
NUMERICAL INTEGRATIO	X X X X X X X X X X X X X X X X X X X			ON X X X ON	Test Routine	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_ Dbl.vi  NumIntegrate_Rk4_ Mat_X_U.vi  NumIntegrate_Rk4_ Mat_X.vi  NumIntegrate_Rkf45.vi  NumIntegrate_Rkf45Impl.vi	Function Prototype	NOT DONE	Code Review	Test Program
NUMERICAL INTEGRATIO	X		X	X X NO	Test Routine	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_Dbl.vi  NumIntegrate_Rk4_Mat_X_U.vi  NumIntegrate_Rk4_Mat_X.vi  NumIntegrate_Rkf45.vi  NumIntegrate_Rkf45Impl.vi  NumIntegrate_Trap_Dbl.vi	Function Prototype	NOT DONE	Code Review	Test Program
NUMERICAL INTEGRATIO	X X X X X X X X X X X X X X X X X X X			X X NO	Test Routine	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_ Dbl.vi  NumIntegrate_Rk4_ Mat_X_U.vi  NumIntegrate_Rk4_ Mat_X.vi  NumIntegrate_Rkf45.vi  NumIntegrate_Rkf45Impl.vi	Function Prototype	NOT DONE	Code Review	Test Program
NUMERICAL INTEGRATION	N	P	X X X	Optimized	utine Test Ro	NumIntegrate_Func_Ax_Bu_K.vi  NumIntegrate_Func_Bs.vi  NumIntegrate_Func_Ch.vi  NumIntegrate_Func_Ct.vi  NumIntegrate_Rk4_Dbl.vi  NumIntegrate_Rk4_Mat_X_U.vi  NumIntegrate_Rk4_Mat_X_V.vi  NumIntegrate_Rk45.vi  NumIntegrate_Rk45Impl.vi  NumIntegrate_Trap_Dbl.vi  NumIntegrate_Trap_Mat.vi	Function Prototype	NOT DONE	teview Code Review	am Test
NUMERICAL INTEGRATION	N	P	X X X	Optimized	utine Test Ro	NumIntegrate_Func_Ax_Bu_K.vi  NumIntegrate_Func_Bs.vi  NumIntegrate_Func_Ch.vi  NumIntegrate_Func_Ct.vi  NumIntegrate_Rk4_Dbl.vi  NumIntegrate_Rk4_Mat_X_U.vi  NumIntegrate_Rk4_Mat_X.vi  NumIntegrate_Rkf45.vi  NumIntegrate_Rkf45Impl.vi  NumIntegrate_Trap_Dbl.vi  NumIntegrate_Trap_Mat.vi	Function Prototype	NOT DONE	Review	Program Test
NUMERICAL INTEGRATION	N	cumented	X X X	Optimized	utine Test Ro	NumIntegrate_Func_Ax_Bu_K.vi  NumIntegrate_Func_Bs.vi  NumIntegrate_Func_Ch.vi  NumIntegrate_Func_Ct.vi  NumIntegrate_Rk4_Dbl.vi  NumIntegrate_Rk4_Mat_X_U.vi  NumIntegrate_Rk4_Mat_X.vi  NumIntegrate_Rkf45.vi  NumIntegrate_Rkf45Impl.vi  NumIntegrate_Trap_Dbl.vi  NumIntegrate_Trap_Mat.vi		NOT DONE NOT DONE	Review	Program Test
NUMERICAL INTEGRATION	X X X X X X X X X X X X X X X X X X X	P	Not WPILIB	timized KXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	utine Test Ro	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_Dbl.vi  NumIntegrate_Rk4_Mat_X_U.vi  NumIntegrate_Rk4_Mat_X.vi  NumIntegrate_Rkf45.vi  NumIntegrate_Rkf45Impl.vi  NumIntegrate_Trap_Dbl.vi	Function Prototype	NOT DONE	Code Review Code Review	am Test

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program plant IV	Function Prototype	Notes	Code Review	Test Program	Error Checking
RICCATI	/			X			Riccati_Check_Detectable.vi		Routine exists, it is just a shell			
	/			X			Riccati_Check_Stabilizable.vi		Not really done !!!			
	X			X		X	Riccati_DARE_Iterate.vi					
	X	Χ		X			Riccati_DARE_N.vi					
	X	Χ		X		X	Riccati_DARE.vi					
	Χ			X			Riccati_Input_Check.vi					

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

> nple Progr Documented
>
> X Not WPILIB
>
> X Menu Item VI Name Function Prototype Notes TypeDef Z ARM FF.CTL X X N/A BICon-Matrix FUNC TYPE.CTL X X N/A CALLBACK FUNC TYPE.CTL Z X X X N/A CHASSIS\_SPEEDS.CTL Z X X X N/A CONTRAINED STATE.CTL X X N/A DCMOTOR.CTL X X N/A DCMOTOR TYPES ENUM.CTL Z X X X N/A DIFF DRIVE KINEMATICS.CTL X X N/A DIFF DRIVE Kitbot WheelSize ENUM.ctl X X N/A DIFF DRIVE POSE EST.ctl Ζ X X N/A DIFF DRIVE ToughBoxMini GearChoice ENUM.ctl Ζ X X N/A DIFF\_DRIVE\_ToughBoxMini\_MotorChoice\_ENUM.ctl Ζ X X N/A DIFF DRIVE TRAIN SIM.ctl Ζ X N/A DIFF DRIVE TRAIN SIM STATE ENUM.CTL Ζ X X N/A ELEV FF.CTL Ζ X X N/A ELEVATOR SIM.CTL Ζ X X N/A EXTENDED KALMAN CORRECT FUNC GROUP.CTL Ζ X X N/A EXTENDED KALMAN FILTER.CTL Ζ X X N/A FLYWHEEL SIM.ctl Ζ X X N/A HOLONOMIC DRV CTRL.CTL New 1/26/21 Ζ X X N/A KALMAN FILTER LATENCY COMP.CTL KALMAN FILTER LATENCY COMP FUNC GROUP.CTL Ζ X X N/A Ζ X X N/A KALMAN FILTER.ctl Z X X X N/A LINEAR FILTER.CTL X X N/A LINEAR PLANT INV FF.ctl LINEAR QUADRATIC REGULATOR.ctl Ζ X X N/A Ζ X X N/A LINEAR SYSTEM LOOP.ctl Ζ LINEAR SYSTEM SIM.ctl X X N/A LINEAR SYSTEM.ctl X X N/A Z X X X N/A MECA DRIVE KINEMATICS.CTL MECA DRIVE ODOMETRY.CTL  $Z \mid X \mid X \mid X \mid N/A$ MECA WHEEL SPEEDS.CTL  $Z \mid X \mid X \mid X \mid N/A$ MEDIAN FILTER.CTL X X N/A Ζ MERWE SCALED SIGMA PTS.ctl X X N/A OBSERVER SNAP LIST ITEM.CTL Ζ X X N/A OBSERVER SNAPSHOT.CTL X X N/A PARAM STACK ITEM.CTL Z X X X N/A

still m	issing	one \	VI)	Added a	dditional columns for test and sample.	
Z		Χ			PARAM STACK.CTL	
Z		Χ	Х		PID ADV LIMITS.CTL	
Z		Χ	X		PID ADV TUNING.CTL	
Z		Χ	Χ		PID CONTROLLER.CTL	
Z		Χ		N/A	PID ERROR TOLERANCE.CTL	
Z		Χ	X		PID INPUT LIMITS.CTL	
Z		Χ	X		PID TUNING.CTL	
Z	Χ	Χ	X		POSE2D.CTL	
Z	X	X	X		POSEwCURVATURE.CTL	
Z		Χ	X		PROFILED PID CONTROLLER.CTL	
Z		Χ	X		RAMSETE EXE TUNING.CTL	
Z	Х		X		RAMSETE.CTL	
Z	X		Х		ROTATION2D.CTL	
Z	X		Х		SIMPLE MOTOR FF.CTL	
Z		Χ	Х		SINGLE JOINT ARM SIM.CTL	
Z		Χ	X		SLEW_RATE_LIMITER.CTL	
Z	Х	X	X		SPLINE CTRL VECTOR.CTL	
Z	X	X	X		SPLINE.CTL SPLINE.	
Z	X	X		N/A	SWERVE DRIVE KINEMATICS.CTL	
Z	X	X	X		SWERVE DRIVE MODULE STATE.CTL	
Z	X	X		N/A	SWERVE DRIVE ODOMETRY.CTL	
Z			X		SWERVE DRIVE POSE EST.CTL	
Z		Χ	Χ		TIMER.CTL	
Z	Х		X		TRAJ CONFIG.CTL	
Z	X	X	Х		TRAJ CONSTRAINT CENTRIPETAL ACCEL.CTL	
Z	Х	X	Х		TRAJ CONSTRAINT DIIF DRIVE KINEMATICS.CTL	
Z	X	Χ	Х		TRAJ CONSTRAINT DIIF DRIVE VOLTAGE.CTL	
1		Χ		N/A	TRAJ CONSTRAINT JERK.CTL	Routine exists, it is just a shell
Z	Χ	Χ	Χ		TRAJ CONSTRAINT MECA DRIVE KINEMATICS.CTL	
Z	Χ	Χ	Χ		TRAJ CONSTRAINT MINMAX.CTL	
Z	Χ	X	Χ		TRAJ CONSTRAINT SWERVE DRIVE KINEMATICS.CTL	
Z	Χ	Χ	Х		TRAJ STATE.CTL	
Z		Χ	X		TRAJECTORY SPLINE TYPE ENUM.CTL	
Z	Χ	Χ	Χ		TRAJECTORY.CTL	
Z	Χ	X		N/A	TRANSFORM2D.CTL	
Z	Χ	Χ		N/A	TRANSLATION2D.CTL	
Z		Χ	Χ	N/A	TRAPEZOID PROFILE CONSTRAINT.CTL	
Z		Χ		N/A	TRAPEZOID PROFILE STATE.CTL	
Z		Χ	Χ	N/A	TRAPEZOID PROFILE.CTL	
Z	Χ	Χ	Χ	N/A	TWIST2D.CTL	
Z		Χ	Χ	N/A	UNSCENTED KALMAN CORRECT FUNC GROUP.CTL	
Z			X		UNSCENTED_KALMAN_FILTER.ctl	
Z		Χ			UNSCENTED KALMAN NEW FUNC GROUP.CTL	
Z	Х		X		UTIL_PATHFINDER_CONFIG.CTL	
Z	X		Х		UTIL_WAYPOINT.ctl	
Z		Χ	Х		UTIL_WEIGHTED_WAYPOINT.ctl	New V1.5
N/A		N/A		N/A	WAYPOINTS.CTL	Delete – obsolete
Z		Χ			WEIGHTED_WAYPOINT.CTL	New V1.5
N/A		N/A		N/A	X_Y_HEADINGS.CTL	Delete – obsolete