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

VI / CTL Totals
VI Total (X)
CTL Total (Z)
VI Shell Total (/)
TRL Shell Total (\)

2

VI Total (X)
CTL Total (Z)
VI Shell Total (/)
TRL Shell Total (\)
2

Doc completed Pct 78.88% Optimization Pct 35.96%

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

'======== BASE

'=========

									•	
LINEAR FILTER		X Documented	Not WPILIB	X Menu Item	ত Execution Optimized	Test Routine	Sample Program	VI Name LinearFilter_Calculate.vi	Function Prototype	Notes
	X	X	X		X			LinearFilter_CutoffFrequency.vi		
	X	X	X	X	1		X	LinearFilter_Execute.vi		Labview style helper
	X	Χ		X	X			LinearFilter_HighPass.vi		
	X	X	X	X	Χ			LinearFilter_HighPassBW1.vi		
	X	X	X	X	X			LinearFilter_HighPassBW2.vi		
	X	Χ	Χ	X	Χ			LinearFilter_LowPassBW1.vi		
	X		X	X	X			LinearFilter_LowPassBW2.vi		
	X	Χ		X	X			LinearFilter_MovingAverage.vi		
	X	Χ		X	1			LinearFilter_New.vi		
	X	X		X	SI			LinearFilter_Reset.vi		
	X	X	X	X	SI			LinearFilter_ResetToValue.vi		
	X	X		X	X			LinearFilter_SinglePoleIIR.vi		
	X	X	X	X	X			LinearFilter_TimeConst.vi		
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
MEDIAN FILTER		X	_	X	X		\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	MedianFilter Calculate.vi	- undustri rototypo	110100
EDIAN I IEIEN	X	X	X	X	I		X	MedianFilter Execute.vi		Labview style helper
	X	X	<u> </u>	X	SI		-	MedianFilter_New.vi		Lastion of to holper
	X	X		X	SI			MedianFilter_Reset.vi		
	X	X	X	X	SI			MedianFilter ResetToValue.vi		
		,,,			<u> </u>	1				

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	I			SlewRateLimiter_Reset.vi		
	Χ	X		X	SI			SlewRateLimiter_SetRate.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimizea	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				Timer_HasPeriodPassed.vi		
	Χ	X	X	X			Χ	Timer_HasPeriodPassedOnce.vi		
	Χ	X		X			X	Timer_New.vi		
	Χ	X		X			Χ	Timer_Reset.vi		
	Χ	X	X	No				Timer_ResetInternal		Internal (private) only
	Χ	X		X				Timer_Start.vi		
	Χ	X		X			X	Timer_Stop.vi		
	Χ	X	X	No				Timer_StopInternal.vi		Internal (private) only

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine		Function Prototype	Notes
ARM FF	X	Χ		Χ			ArmFF_Calculate.vi		
	Χ	Χ		Χ			ArmFF_CalculateVelocityOnly.vi		
			Χ				ArmFF_Execute.vi		LabVIEW style single call
			Χ				ArmFF_ExecuteVelocityOnly.vi		LabVIEW style single call
	X	Χ		Χ			ArmFF_MaxAchieveAccel.vi		
	X	Χ		Χ			ArmFF_MaxAchieveVelocity.vi		
	X	Χ		Χ			ArmFF_MinAchieveAccel.vi		
	X	Χ		Χ			ArmFF_MinAchieveVelocity.vi		
	X	Χ		Χ			ArmFF_New.vi		
	X	Χ		Χ			ArmFF_New_ZeroGravity.vi		

Re Space Items – (This list is still missing one VI) Added additional columns for test and sample. Space Items – (This list is still missing one VI) Added additional columns for test and sample. Respect Items – (This list is still missing one VI) Added additional columns for test and sample. Respect Items – (This list is still missing one VI) Added additional columns for test and sample. Respect Items – (This list is still missing one VI) Added additional columns for test and sample. Respect Items – (This list is still missing one VI) Added additional columns for test and sample. Respect Items – (This list is still missing one VI) Added additional columns for test and sample.	rary – VI Implementatio	on L	st								
Purction Prototype	Space Items – (This list is	s still	missir	g one	VI	.) Add	ded a	dditio	nal columns for test and sample.	_	
Barrier Barr					Menu Item	Execution Optimizec	Test Routine	Sample Program		Function Prototype	
Pundon Prototype	CONTROLLER UT	IL X	X		X	SI			ControllerUtil_GetModulusError.vi		This was short lived in WPILIB, but
HOL_DRY_CTRL X	ELEV F	X	X X X X X X X X	X	X X X X X X	Execution	Test Routine	Sample Program	VI Name ElevFF_Calculate.vi ElevFF_CalculateVelocityOnly.vi ElevFF_Execute.vi ElevFF_ExecuteVelocityOnly.vi ElevFF_MaxAchieveAccel.vi ElevFF_MaxAchieveVelocity.vi ElevFF_MinAchieveAccel.vi ElevFF_MinAchieveVelocity.vi ElevFF_MinAchieveVelocity.vi ElevFF_New.vi	Function Prototype	Notes LabVIEW style single call
HOL_DRY_CTRL X		lmnlemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
Added 1/26/21 Added 1/26/21 Future Futur	HOL_DRV_CTR	$RL \Delta$	X		X				HolDrvCtrl_AtReference.vi	7.	
Notes PID CONTROLLER		X	X	X	X				HolDrvCtrl_Calculate_Trajectory.vi HolDrvCtrl_Execute.vi HolDrvCtrl_Execute_Trajectory.vi HolDrvCtrl_New.vi		Added 1/26/21 Future Future Added 1/26/21
PID CONTROLLER X X X X X PIDController AdvCalculate FF Sp Pv. vi X X X X PIDController AdvExecute.vi PIDController Advanced PID Advanced PID Labview style helper. Advanced X X X X X PIDController Calculate PV.vi X X X X X PIDController Calculate PV.vi X X X X X PIDController Calculate PV.vi X X X X X PIDController DisableContinousInput.vi X X X X X PIDController Execute.vi Advanced PID Labview style helper. Advanced PID Advanced PID Labview style helper. Advanced PIDController Calculate SP.V.vi X X X X PIDController DisableContinousInput.vi X X X X Y PIDController Execute.vi Labview style helper PIDController Execute.vi Labview style helper PIDController Execute.vi Advanced PID		$\frac{1}{\lambda}$	· X								
X X X X X X Advanced PID X X X X X Labview style helper. Advanced PID X X X X PIDController_AtSetpoint.vi Image: Controller_AtSetpoint.vi Image: Controller_AtSetpoint.vi X X X X PIDController_Calculate_PV.vi Image: Controller_AtSetpoint.vi Image: Controller_AtSetpoint.vi X X X X PIDController_Calculate_PV.vi Image: Controller_AtSetpoint.vi Image: Controller_AtSetpoint.vi X X X X PIDController_DisableContinousInput.vi Image: Controller_AtSetpoint.vi Image: Controller_AtSetpoint.vi X X X X X PIDController_EnableContinousInput.vi Image: Controller_AtSetpoint.vi Image: Controller_AtSetpoint.vi Image: Controller_AtSetpoint.vi X X X X X X PIDController_EnableContinousInput.vi Image: Controller_AtSetpoint.vi Image: Controller_A			Documented	Not WPILIB	Menu Item		Test Routine	Sample Program	VI Name	Function Prototype	Notes
X X X X PIDController_AdvExecute.vi Labview style helper. Advanced PID X X X X PIDController_AtSetpoint.vi IDController_Calculate_PV.vi X X X X PIDController_Calculate_PV.vi IDController_Calculate_SP_PV.vi X X X X PIDController_DisableContinousInput.vi IDController_EnableContinousInput.vi X X X X X PIDController_Execute.vi Labview style helper PIDController_GetContinuousError.vi OBSOLETE - Removed	PID CONTROLLE										
PIDController_GetContinuousError.vi OBSOLETE – Removed		x x x x	X X X X X X X	X	X X X X X				PIDController_AdvExecute.vi PIDController_AtSetpoint.vi PIDController_Calculate_PV.vi PIDController_Calculate_SP_PV.vi PIDController_DisableContinousInput.vi PIDController_EnableContinousInput.vi		Labview style helper. Advanced PID
		X	X	X	X			X			
		χ	X		X						133322.2 110110100

FRC_LabVIEW_Trajectory_Library_Routines.xlsx Page 3 / 29

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

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

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

DAMOSTS	(Implemented	Documented	Not WPILIB	Menu Item	Execution Optimize	Test Routine	 VI Name	Function Prototype	Notes
RAMSETE	Χ	Χ		X	SI		Ramsete_New.vi	new	
	Χ	X		Χ	SI		Ramsete_New_B_Z.vi	new(b, zeta)	
	Χ	Χ		Χ	Χ		Ramsete_Calculate.vi	calculate	
	Χ	Χ		Χ	Χ		Ramsete_Calculate_Trajectory.vi	calculate_trajectory	
	Χ	X		Χ	SI		Ramsete_AtReference.vi	AtReference	
	Χ	Χ		Χ	SI		Ramsete_SetEnabled.vi	SetEnabled	
	Χ	Χ		Χ	SI		Ramsete_SetTolerance.vi	SetTolerance	
	Χ	Χ		Χ	X		Ramsete_SINC.vi	sinc	internal
	Χ	X	X	Χ	X		Ramsete_Diff_DO_Eng.vi		
	Χ	X	X	Χ	X		Ramsete_Diff_DO_SI.vi		

	Implemented	Oocumented	Not WPILIB	Menu Item	Execution Optimized	est Routine	sample Program	VI Name	Function Prototype	Notes
SIMPLE MOTOR FEEDFORWARD		X		\ <u></u>	SI			SimpleMotorFF New.vi	public SimpleMotorFeedforward(double ks, double kv, double ka)	Notes
OIMI EE MOTORT EEDI ORWARD				^	0,			Ompleword 1_Ivew.vi	public diriple violetti dedioi ward (dedible ka, dedible kv, dedible ka)	
									public SimpleMotorFeedforward(double ks, double kv)	
	Χ	Χ		X	SI			SimpleMotorFF_Calculate.vi	public double calculate(double velocity, double acceleration)	
	Χ	Χ		X	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_MaxAchieveVel.vi	public double maxAchievableVelocity(double maxVoltage, double acceleration)	
	X	Χ		X	X			SimpleMotorFF_MinAchieveVel.vi	public double minAchievableVelocity(double maxVoltage, double acceleration)	
	X	Χ		X	Х			SimpleMotorFF_MaxAchieveAccel.vi	public double maxAchievableAcceleration(double maxVoltage, double velocity)	
	X	X		X	X			SimpleMotorFF_MinAchieveAccel.vi	public double minAchievableAcceleration(double maxVoltage, double velocity)	

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

Function Prototype Notes pose2d new() can use cluster constant Pose New TRRO.vi pose2d new(translation2d, rotation2d) $X \mid X \mid$ X SI X SI Pose New.vi XX pose2d new(double x, double y, rotation2d) XX X SI Pose Plus.vi pose2d plus(transform2d other) Pose Minus.vi XX X SI transform2d minus(pose2d other) Pose_getTranslation.vi XX X SI translation2d getTranslation() can also use cluster unpack XX X SI Pose_getRotation.vi rotation2d getRotation() can also use cluster unpack X X X X SI Pose_getXY.vi X X X X SI Pose_getXYAngle.vi pose2d transformby(transform2d other) XX X SI Pose_TransformBy.vi X SI Pose_RelativeTo.vi XX pose2d relativeto(pose2d other) XX XX Pose_Exp.vi pose2d exp(twist2d twist)

X	- X	X	X	Pose_Log.vi	twist2d log(pose2d end)	
X	- X	X	SI		boolean equals(other obj)	

ROTATION	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	N Name	Function Prototype	Notes can use cluster constant
RUTATION	Χ	Χ		Χ	SI		Detetion Create Angle vi	rotation2d new()	can use cluster constant
	X	X		X	SI		Rotation_CreateAngle.vi Rotation_CreateXY.vi	rotation2d new(double value) rotation2d new(double x, double y)	
	X	X		X	SI		Rotation_CreateAngleDegrees.vi	rotation2d fromDegrees(double y)	convert to radians then create
	X			X	SI		Rotation Plus.vi		convert to radians their create
		X		X	_		-	rotation2d plus(rotation2d other)	
	X	X			SI		Rotation_Minus.vi	rotation2d minus(rotation2d other)	
	X	X		X	SI		Rotation_UnaryMinus.vi	rotation2d unaryminus()	
	X	X		X	SI		Rotation_Times.vi	rotation2d times(double scalar)	
	X	Χ		X	SI		Rotation_RotateBy.vi	rotation2d rotateby(rotation2d other)	1/00/04
	Χ	Χ	Χ	Χ	SI		Rotation_GetAngleCosSin.vi		New 1/26/21
	X	Χ		X	SI		Rotation_GetRadians.VI	double getRadians()	use cluster unpack
	X	X		X	SI			double getDegrees()	use cluster unpack, then convert to
							5 () 0 (0) 1		degree
	Χ	Χ		Χ	SI		Rotation_GetCos.VI	double getCos()	use cluster unpack
	X	Χ		Χ	SI		Rotation_GetSin.VI	double getSin()	use cluster unpack
	X	Χ		Χ	SI		Rotation_GetTan.VI	double getTan()	can calculate
	X	Χ		Χ	SI		Rotation_Equals.vi	boolean equals(rotation2d other)	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimize	Test Routine	Sample Program IA awe IA		Function Prototype	Notes
TRANSFORM	X	X		Χ	SI		Transform	_Create_PosePose.vi	transform2d new(pose2d, pose2d)	
	Χ	Χ		Χ	SI		Transform	_Create_TransRot.vi	transform2d new(translation2d, rotation2d)	
									transform2d new()	can use cluster constant
	Χ	Χ		Χ	SI		Transform	_Times.vi	transform2d times(double scalar)	
	Χ	Χ		Χ	SI		Transform	_GetTranslation.VI	translation2d getTranslation()	use cluster unpack
	Χ	Χ		Χ	SI		Transform	_GetRotation.VI	rotation2d getRotation()	use cluster unpack
	Χ	Χ	Χ	Χ	SI		Transform	_GetXY.vi		
	X	X	Χ	Χ	SI		Transform	_GetXYAngle.vi		
	X	Χ		Χ	SI		Transform	_Inverse.vi	transform inverse()	new
	X	Χ		Χ	SI		Transform	_Equals.VI	boolean equals(other transform2d)	

TRANSLATION	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program emple Program	Function Prototype translation2d new()	Notes can use cluster constant
IKANSLATION								V	can use ciustei constant
	Χ	Χ		X	SI		Translation_Create.vi	translation2d new(double x, double y)	
	Χ	X		X	SI		Translation_Create_DistAng.vi		
	Χ	Χ		X	SI		Translation_GetDistance.vi	double getDistance(translation2d other)	
	Χ	X		X	SI		Translation_GetX.VI	double getX()	can use cluster unpack
	X	X		X	SI		Translation_GetY.VI	double getY()	can use cluster unpack
	Χ	Χ	Χ	Χ	SI		Translation_GetXY.VI		
	Χ	X		X	SI		Translation_GetNorm.VI	double getNorm()	can use cluster unpack
	Χ	X		X	SI		Translation_RotateBy.vi	translation2d rotateBy(rotation2d other)	
	Χ	X		X	SI		Translation_Plus.vi	translation2d plus(translation2d other)	

ision 2 X = 11/12/2021 = State Snace Itame = (This list is a	List							
vision 2.X 11/12/2021 – State Space Items – (This list is s) Ad	ded additio		1. 1.5 01 . (/ 1.5 01 .)	
	X	$\frac{X}{Y}$	X	SI		Translation_Minus.vi	translation2d minus(translation2d other)	
			X	SI		Translation_UnaryMinus.vi	translation2d unaryminus()	
	Χ	X	X	SI		Translation_Times.vi	translation2d times(double scalar)	10: 1 1 4/ 1
	14			′ 0′		T 10 F 1 :	translation2d div(double scalar)	can multiply by 1/scalar
l	X	<u>X</u>	X	. SI		Translation_Equals.vi	boolean equals(translation other)	
TWIST	X X Implemented	X X	X X X X X X X X X X X X X X X X X X X	SI	Test Routi Sample Pr	VI Name Twist_Create.vi Twist_Equals.VI Twist_GetAll.VI	Function Prototype twist new(x, y, theta) boolean equals(obj other)	Notes
======= EMATICS ========								
CHASSIS SPEEDS	X X	X	Not WPILIB X X Menu Item	SI SI		VI Name ChassisSpeeds_New.vi ChassisSPeeds_GetXYOmega.vi	Function Prototype chassisspeeds new () chassisspeeds new (double xvel, double yvel, double angvel)	Notes can use cluster constant
	X	X	X	. 31		ChassisSpeeds_FromFieldRelativeSpeeds.VI	chassisspeeds fromFieldRelativeSpeeds(double x, double y, double angvel, rotation2d robotangle)	
				mized	E.			
DIFFERENTIAL DRIVE KINEMATICS	Χ	X X	Not WPILIB X X Menu Item		X	VI Name DiffKinematics_New.vi DiffKinematics_toChassisSpeed.vi DiffKinematics_toWheelSpeed.vi	Function Prototype diffDriveKine new(double trackWidth) chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds) diffDriveWheelSpeed toWheelSpeeds(chassisSpeeds)	Notes
	Implemented X X X Imp	X X X	X X	Optimized S	x X X X mple Program	DiffKinematics_New.vi DiffKinematics_toChassisSpeed.vi	diffDriveKine new(double trackWidth) chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds) diffDriveWheelSpeed toWheelSpeeds(chassisSpeeds) Function Prototype	Notes
DIFFERENTIAL DRIVE KINEMATICS	Implemented X X X Imp	X X X	WPILIB Not X X X X X X X X X X X X X X X X X X X	Optimized S	x X X X mple Program	DiffKinematics_New.vi DiffKinematics_toChassisSpeed.vi DiffKinematics_toWheelSpeed.vi	diffDriveKine new(double trackWidth) chassisSpeeds toChassisSpeeds (diffDrWheelSpeeds) diffDriveWheelSpeed toWheelSpeeds (chassisSpeeds) Function Prototype diffDrOdom new(rotation gyro, pose initial)	
	Implemented X X X Imp	X X X	WPILIB Not X X X X X X X X X X X X X X X X X X X	Optimized S	x X X X mple Program	DiffKinematics_New.vi DiffKinematics_toChassisSpeed.vi DiffKinematics_toWheelSpeed.vi	diffDriveKine new(double trackWidth) chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds) diffDriveWheelSpeed toWheelSpeeds(chassisSpeeds) Function Prototype diffDrOdom new(rotation gyro, pose initial) diffDrOdom new(rotation gyro)	Notes
	Implemented X X X Imp	X X X	WPILIB Not X X X X X X X X X X X X X X X X X X X	Optimized S	x X X X mple Program	DiffKinematics_New.vi DiffKinematics_toChassisSpeed.vi DiffKinematics_toWheelSpeed.vi	diffDriveKine new(double trackWidth) chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds) diffDriveWheelSpeed toWheelSpeeds(chassisSpeeds) Function Prototype diffDrOdom new(rotation gyro, pose initial) diffDrOdom new(rotation gyro) void resetPosition(pose2d, rotation2d)	
	Implemented X X X Imp	X X X	WPILIB Not X X X X X X X X X X X X X X X X X X X	Execution Optimized	Test Routine X X X X Sample Program	DiffKinematics_New.vi DiffKinematics_toChassisSpeed.vi DiffKinematics_toWheelSpeed.vi	diffDriveKine new(double trackWidth) chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds) diffDriveWheelSpeed toWheelSpeeds(chassisSpeeds) Function Prototype diffDrOdom new(rotation gyro, pose initial) diffDrOdom new(rotation gyro)	Notes incorporated into "update"

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rajectory Library – VI Implementatio	n Lis	<u>it</u>							
2/2021 – State Space Items – (This list is	still m	ıssıng	g one	VI) Add	ded ac	Iditional columns for test and sample.		
					mize		шe.		
	g	P			Optii	a)	ıgra		
	Implementea	Documentea	Not WPILIB	ш	_	Fest Routine	Progr		
	эше	ıme	ΝΡ	Menu Item	Execution	Rol	e/a		
	nple	700	ot V	Jeni	xec	est	S Name NI Name	Curation Dustations	Notes
DIFFERENTIAL DRIVE WHEEL SPEEDS		<u> </u>	_ <	_≥	Ш	<u> </u>	ශී VI Name	Function Prototype diffDrWheelSpeeds new()	Notes
DIFFERENTIAL DRIVE WHEEL SPEEDS	'	_	+					diffDrWheelSpeeds new() diffDrWheelSpeeds new(double leftVel, double rightVel)	
	X	X		X	X		DiffWheel Normalize.vi	void normalize(double maxVel)	
				-1					
					zeo				
					Optimi		aπ		
	pə	pə	В	_	do	ие	Progr		
	Implemented	Documentea	Not WPILIB	Menu Item		Test Routine	Ţ.		
	lem	щn	Ŋ	ון ח	Execution	t RC	S VI Name		
	dm	90	ζo	Ner	i. X	res	S VI Name	Function Prototype	Notes
MECANUM DRIVE KINEMATICS		X		\overline{X}	I		MecaKinematics_New.vi	Interest Interest	
	X	X		X	X		MecaKinematics_SetInverseKinematics.vi		
	X	Χ		X			MecaKinematics_ToChassisSpeeds.vi		
	X	X		X	X		MecaKinematics_ToWheelSpeeds.vi		
	X	Χ		X	X		MecaKinematics_ToWheelSpeedsZeroCenter.vi		
					P				
					ized				
					ţin		ra T		
	jed,	p _e	В	_	Optin	Je	Progr		
	ent	ent	77/	e.	on	iti	<u>a</u>		
	_e m	ŭ,	¥	ת ח	cuti	R	ə <i>ldt</i>		
	Implemented	Documented	Not WPILIB	Menu Item	Execution	Test Routine	S VI Name	Function Prototype	Notes
MECANUM DRIVE MOTOR VOLTAGE		_		_<			Virtaino	T diletion i Tototype	140103
		done					-		
					~				
					Execution Optimized				
					timi		Program		
	pə	pa	99		Õ	e 2	<i>go</i>		
	mented	mented	VPILIB	Item	on	Routine	Ţ.		
	em	ű,	×		cuti	Ä	e/di		
	Imple	Docui	Not N	Menu	ĕ	Test F	Name	Function Prototype	Notes
MECANUM DRIVE ODOMETRY		X		<u> </u>	Ш.	_	MecaOdometry_New.vi		Notes
	X			X	1		MecaOdometry_NewDefaultPose.vi		
	X	X		X			MecaOdometry_GetPose.vi		
	X	X		X			MecaOdometry_Reset.VI		
	X	X		X			MecaOdometry_Update.vi		
	X	X		X			MecaOdometry_UpdateWithTime.vi		
					Q				
					ize				
					Optimized		άπ		
	<i>ted</i>	ρə	В	_	õ	ne	60		
	ien:	ent	게	tem		inc			
	Implemented	Documented	Not WPILIB	Menu Item	Execution	Test Routine	Sample Prog		
	шb	200	Vot	/Jen	ě	Pesi	N Name	Function Prototype	Notes
MECANUM DRIVE WHEEL SPEEDS		X	_~	<u> </u>	SI	_	MecaWheel_New.Vi	public MecanumDriveWheelSpeeds(double	1.000
	^`			^`	"			frontLeftMetersPerSecond, double frontRightMetersPerSecond,	
								double rearLeftMetersPerSecond, double	
	-		+	\	V		MocaWhaal Normaliza vi	rearRightMetersPerSecond)	
	X	X		\ \ \	X		MecaWheel_Normalize.vi	public void normalize(double attainableMaxSpeedMetersPerSecond)	
								Attainabilitian operativistici el Decolla)	1

Revision 2.X 11/12/2021 – State Space Ite	ems – (This list is st	ill mi	ssing	one \	/l)	Adde	ed ad	ditio	al columns for test and sample.	_	
		Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	// Nama	Function Protetyne	Notes
SWERVE DR	IVE KINEMATICS	=	٥	_	2	Ш	_	S	/I Name	Function Prototype public SwerveDriveKinematics(Translation2d wheelsMeters)	variable parameters (replace with
										,	array and "4" calls)
		X	X	X	X				SwerveKinematics_NewX.VI SwerveKinematics_New4.VI		uses array as input For 4 module drives
		X	X	^	X				SwerveKinematics_New4.vi	public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds,	For 4 module drives
		Χ	X		X				SwerveKinematics_ToSwerveModuleStatesZeroCenter.VI	Translation2d centerOfRotationMeters) public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds)	
										public ChassisSpeeds to ChassisSpeeds (Swerve Module State wheel States)	variable parameters (replace with array and "4" calls)
		X	Χ						SwerveKinematics_ToChassisSpeedsX.VI		uses array as input
				Χ					SwerveKinematics_ToChassisSpeeds4.VI		For 4 module drives
		X	X	X	<i> </i>				SwerveKinematics_NormalizeWheelSpeeds.vi	public static void normalizeWheelSpeeds(SwerveModuleState[] moduleStates, double attainableMaxSpeedMetersPerSecond)	
SWERVE DF	RIVE ODOMETRY	X Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine		/I Name SwerveOdometry_New.VI	Function Prototype public SwerveDriveOdometry(SwerveDriveKinematics kinematics,	Notes
		X	X	-	X				SwerveOdometry_NewZeroCenter.VI	Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics,	,
	-									Rotation2d gyroAngle)	
			· V	\rightarrow					Swanta Odomatry Pasat Position VI	nublic yold resetPosition(Pose2d pose, Potation2d gyroAngle)	
			X		X				SwerveOdometry_ResetPosition.VI SwerveOdometry_GetPosition.VI	public void resetPosition(Pose2d pose, Rotation2d gyroAngle)	
		X	X		X				SwerveOdometry_GetPosition.VI	public void resetPosition(Pose2d pose, Rotation2d gyroAngle) public Pose2d getPoseMeters() public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates)	array and "4" calls)
		X	X	X	X				SwerveOdometry_GetPosition.VI SwerveOdometry_UpdateWithTimeX.VI	public Pose2d getPoseMeters() public Pose2d updateWithTime(double currentTimeSeconds,	array and "4" calls) uses array as input
		X	X	X X	X				SwerveOdometry_GetPosition.VI	public Pose2d getPoseMeters() public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates)	array and "4" calls) uses array as input For 4 module drives
		X X X	X X X	X	X X X				SwerveOdometry_GetPosition.VI SwerveOdometry_UpdateWithTimeX.VI SwerveOdometry_UpdateWithTime4.VI	public Pose2d getPoseMeters() public Pose2d updateWithTime(double currentTimeSeconds,	array and "4" calls) uses array as input For 4 module drives
		X X X	X X X	X	X X X				SwerveOdometry_GetPosition.VI SwerveOdometry_UpdateWithTimeX.VI SwerveOdometry_UpdateWithTime4.VI SwerveOdometry_UpdateWithTime4.VI	public Pose2d getPoseMeters() public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle,	array and "4" calls) uses array as input For 4 module drives variable parameters (replace with array and "4" calls) uses array as input
		X X X	X X X	X	X X X				SwerveOdometry_GetPosition.VI SwerveOdometry_UpdateWithTimeX.VI SwerveOdometry_UpdateWithTime4.VI	public Pose2d getPoseMeters() public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle,	array and "4" calls) uses array as input For 4 module drives variable parameters (replace with array and "4" calls)
		X X X X	X X X X	X X X	X X X X	ecution Optimized	st Routine	mple Program	SwerveOdometry_GetPosition.VI SwerveOdometry_UpdateWithTimeX.VI SwerveOdometry_UpdateWithTime4.VI SwerveOdometry_UpdateX.VI SwerveOdometry_UpdateX.VI	public Pose2d getPoseMeters() public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, SwerveModuleState moduleStates)	array and "4" calls) uses array as input For 4 module drives variable parameters (replace with array and "4" calls) uses array as input For 4 module drives
		X X X X X X X X X X X X X X X X X X X	X X X X	X	X X X X	Execution Optimized	Test Routine	Sample Program	SwerveOdometry_GetPosition.VI SwerveOdometry_UpdateWithTimeX.VI SwerveOdometry_UpdateWithTime4.VI SwerveOdometry_UpdateX.VI SwerveOdometry_UpdateX.VI SwerveOdometry_Update4.VI	public Pose2d getPoseMeters() public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, SwerveModuleState moduleStates) Function Prototype	uses array as input For 4 module drives variable parameters (replace with array and "4" calls) uses array as input
SWERVE DRIVE	MODULE STATE	X X X X X	X X X X	X X X	X X X X X	SI	Test Routine	Sample Program	SwerveOdometry_GetPosition.VI SwerveOdometry_UpdateWithTimeX.VI SwerveOdometry_UpdateWithTime4.VI SwerveOdometry_UpdateX.VI SwerveOdometry_UpdateX.VI SwerveOdometry_Update4.VI	public Pose2d getPoseMeters() public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, SwerveModuleState moduleStates) Function Prototype public SwerveModuleState(double speedMetersPerSecond, Rotation2d angle)	array and "4" calls) uses array as input For 4 module drives variable parameters (replace with array and "4" calls) uses array as input For 4 module drives
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		Test Routine	Sample Program	SwerveOdometry_GetPosition.VI SwerveOdometry_UpdateWithTimeX.VI SwerveOdometry_UpdateWithTime4.VI SwerveOdometry_UpdateX.VI SwerveOdometry_UpdateX.VI SwerveOdometry_Update4.VI	public Pose2d getPoseMeters() public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, SwerveModuleState moduleStates) Function Prototype public SwerveModuleState(double speedMetersPerSecond,	array and "4" calls) uses array as input For 4 module drives variable parameters (replace with array and "4" calls) uses array as input For 4 module drives Notes

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

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

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s sti	ll mis	sing	one \	/l)	Add	ed ac	lditional columns for test and sample.	
R	X	X		X		X	SplineHelp_GetCubicCtrlVectorsFromWayPts.vi	public static Spline.ControlVector[] getCubicControlVectorsFromWaypoints(Pose2d start, Translation2d[] interiorWaypoints, Pose2d end)
	Χ	Χ	Χ	X			SplineHelp_GetCubicCtrlVectorsFromWeightedWayPts.vi	
	X	X		X			SplineHelp_GetQuinticCtrlVectorsFromWayPts.vi	public static List <spline.controlvector> getQuinticControlVectorsFromWaypoints(List<pose2d> waypoints)</pose2d></spline.controlvector>
	Χ	Χ	Χ	X			SplineHelp_GetQuinticCtrlVectorsFromWeightedWayPts.vi	
	X	X		Χ		Χ	SplineHelp_getCubicSplinesFromControlVectors.vi	public static CubicHermiteSpline[] getCubicSplinesFromControlVectors(Spline.ControlVector start, Translation2d[] waypoints, Spline.ControlVector end)
	X	Χ	Χ	No			SplineHelp_GetCubicSpline_Calc1.vi	internal
	X	Χ	Χ	No			SplineHelp_GetCubicSpline_Calc2.vi	internal
	X	Χ	X	No			SplineHelp_GetCubicSpline_Calc3.vi	internal
	X	X		Χ			SplineHelp_getQuinticSplinesFromControlVectors.vi	public static QuinticHermiteSpline[] getQuinticSplinesFromControlVectors(Spline.ControlVector[] controlVectors)
	X	Χ		No			SplineHelp_ThomasAlgorithm.vi	private static void thomasAlgorithm(double[] a, double[] b, double[] internal c, double[] d, double[] solutionVector)
	X	Χ		Χ	SI		SplineHelp_GetCubicCtrlVector.vi	private static Spline.ControlVector getCubicControlVector(double scalar, Pose2d point)
	X	Χ		Χ	SI		SplineHelp_GetQuinticCtrlVector.vi	private static Spline.ControlVector getQuinticControlVector(double scalar, Pose2d point)

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
SPLINE PARAMETERIZER	X	X		X		X		SplineParam_Spline.vi	public static List <posewithcurvature> parameterize(Spline spline)</posewithcurvature>	
	X	Χ		X					public static List <posewithcurvature> parameterize(Spline spline, double t0, double t1)</posewithcurvature>	
	X	Χ	X	No				SplineParam_StackGet.vi		internal
	X	Χ	X	No				SplineParam_StackPop.vi		internal
	Χ	X	X	No				SplineParam_StackPush.vi		internal

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

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

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FRC LabVIEW Trajectory Library – VI Implementation Revision 2.X 11/12/2021 – State Space Items – (This list is s			one '	VI)	Adde	ed add	ditional columns for test and sample.		
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Nample Program	Function Prototype	Notes
TRAJECTORY_STATE	Χ	Χ		X	SI		TrajectoryState_New.vi	public State() public State(double timeSeconds, double	
								velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter)	
	X	X		X			TrajectoryState_Interpolate.vi	State interpolate(State endValue, double i)	FUTURE

TrajectoryState_Interpolate.vi
TrajectoryState_Equals.vi

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Name Program		Notes
TRAJECTORY CONFIG	X	X		X	SI		TrajectoryConfig_Create.vi	public TrajectoryConfig(double maxVelocityMetersPerSecond,	
								double maxAccelerationMetersPerSecondSq) public TrajectoryConfig addConstraint(TrajectoryConstraint constraint)	Implemented differently, can't duplicate.
								public TrajectoryConfig addConstraints(List extends TrajectoryConstraint constraints)	Implemented differently, can't duplicate.
	Χ	Χ		Χ	SI		TrajectoryConfig_setKinematicsDiffDrive.vi	public TrajectoryConfig setKinematics(DifferentialDriveKinematics kinematics)	duplicate.
	X	X		X	SI		TrajectoryConfig_setKinematicsMecanumfDrive.vi	public TrajectoryConfig setKinematics(MecanumDriveKinematics kinematics)	
	X	Χ		X	SI		TrajectoryConfig_setKinematicsSwerveDrive.vi	public TrajectoryConfig setKinematics(SwerveDriveKinematics kinematics)	
								public double getStartVelocity()	can use cluster unpack
								public TrajectoryConfig setStartVelocity(double startVelocityMetersPerSecond)	
								public double getEndVelocity()	can use cluster unpack
								public TrajectoryConfig setEndVelocity(double endVelocityMetersPerSecond)	
								public double getMaxVelocity()	can use cluster unpack
								public double getMaxAcceleration()	can use cluster unpack
								public List <trajectoryconstraint> getConstraints()</trajectoryconstraint>	Implemented differently, can't duplicate.
								public boolean isReversed()	can use cluster unpack
	Χ	Χ		Χ	SI		TrajectoryConfig_setReversed.vi	public TrajectoryConfig setReversed(boolean reversed)	
	X	Χ	X	Χ	SI		TrajectoryConfig_setCentripetalAccel.vi		
	X	Χ	X	X	SI		TrajectoryConfig_setVoltageDiffDrive.vi		
								NOTE ADD OTHER "SET" ROUTINES FOR OTHER	

NOTE ADD OTHER "SET" ROUTINES FOR OTHER CONTRAINTS HERE, SINCE NEW CONTRAINTS ARE SPECIFIC AND NOT GENERIC.

boolean equals(other obj)

FUTURE

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	√I Name	Function Prototype	Notes
TRAJECTORY GENERATE	X	X		X			-	TrajectoryGenerate_Make_Cubic_CtrlVect.vi	public static Trajectory generateTrajectory(Spline.ControlVector initial, List <translation2d> interiorWaypoints, Spline.ControlVector end, TrajectoryConfig config)</translation2d>	uses cubic splines
	X	X		X			-	TrajectoryGenerate_Make_Cubic.vi		uses cubic splines

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Revision 2.X 11/12/2021 – State Space Items – (This list is s					Added	additio			
	X			X			TrajectoryGenerate_Make_Quintic_CtrlVect.vi	public static Trajectory generateTrajectory(ControlVectorList controlVectors, TrajectoryConfig config)	uses quintic splines
	X	X		X			TrajectoryGenerate_Make_Quintic.vi	public static Trajectory generateTrajectory(List <pose2d> waypoints, TrajectoryConfig config)</pose2d>	uses quintic splines
	X	X		X			TrajectoryGenerate_splinePointsFromSplines.vi	public static List <posewithcurvature> splinePointsFromSplines(Spline[] splines)</posewithcurvature>	
TRAJECTORY GENERATE (Control Vector)	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Sample Program	VI Name	Function Prototype public ControlVectorList(int initialCapacity) public ControlVectorList() public ControlVectorList(Collection extends Spline.ControlVector collection)	Notes may not need, just data may not need, just data may not need, just data
	Implemented	Documented		Menu Item	Execution Optimized	sample Program	VI Name	Function Prototype	Notes
TRAJECTORY PARAMETERIZE		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) private static void enforceAccelerationLimits(boolean reverse,</trajectoryconstraint></posewithcurvature>	This routings mode to be abouted
	X	X		No			TrajectoryParam_enforceAccel.vi	List <trajectoryconstraint> constraints, ConstrainedState state)</trajectoryconstraint>	This routines needs to be changed when new constraints are added.
		X		No			TrajectoryParam_calcStuffFwd.vi		
	X	X					TrajectoryParam_calcStuffRev.vi		This would be a second
	X	X	X	No			TrajectoryParam_enforceVelocity.vi		This routines needs to be changed when new constraints are added.
TRAJECTORY PARAMETERIZE CONSTRAINED STATE	X Implemented	X Documented		X Menu Item	Execution Optimized	Sample Program	VI Name ConstrainedState_New.vi	Function Prototype ConstrainedState(PoseWithCurvature pose, double	Notes
								distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double maxAccelerationMetersPerSecondSq) ConstrainedState()	
	Χ	Χ	X	Χ			ConstrainedState_SetMaxAccel.vi	V	
		X					ConstrainedState_SetMinAccel.vi		
	X		X	X			ConstrainedState_SetVelAccel.vi		
	Ϋ́	X	X	X			ConstrainedState_SetVelocity.vi		
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	rest Koutine Sample Program	VI Name	Function Prototype	Notes

TRAJECTORY UTIL	Χ	X		X			TrajectoryUtil_fromPathWeaverJSON.vi	public static Trajectory fromPathweaverJson(Path path)	
	X	X		X			TrajectoryUtil_toPathWeaverJSON.vi	public static void toPathweaverJson(Trajectory trajectory, Path	
								path)	
								public static Trajectory deserializeTrajectory(String json) public static String serializeTrajectory(Trajectory trajectory)	
l								public static offing serialize frajectory (frajectory trajectory)	
TRAPEZOID PROFILE	X X X X X X X X X X X X X X X X X X X	X X X X X X X X	X	X X X X X X X X X X X X X X X X X X X	Execution Optimized	Sample Program	VI Name TrapProfConstraint_New.vi TrapProfile_Calculate.vi TrapProfile_Direct.vi TrapProfile_Execute.vi TrapProfile_IsFinished.vi TrapProfile_New.vi TrapProfile_New_DefInitial.vi TrapProfile_ShouldFlipAcceleration.vi TrapProfile_TimeLeftUntil.vi TrapProfState_Equals.vi TrapProfState_Equals.vi TrapProfState_New.vi	Function Prototype	Notes Private, remove from menu Private, remove from menu
'========= TDA (5070D) (0010TDAN)T									
TRAJECTORY CONSTRAINT '========									
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CENTRIPETAL ACCELERATION CONSTRAINT	X Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimi	Sample Program	VI Name CentripetalAccelConstraint_getMaxVelocity.vi	Function Prototype public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double	Notes
								velocityMetersPerSecond)	
	X	X		X			CentripetalAccelConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	Χ	Χ		X	SI		CentripetalAccelConstraint_New.vi	public CentripetalAccelerationConstraint(double maxCentripetalAccelerationMetersPerSecondSq)	Can use cluster pack for now
DIFF DRIVE KINEMATIC CONSTRAINT	X Implemented	X X Documented	Not WPILIB	X Menu Item		Sample Program	DiffDriveKinematicsConstraint_getMaxVelocity.vi DiffDriveKinematicsConstraint_getMinMaxAccel.vi	Function Prototype public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	Notes
	X	X		X	SI		DiffDriveKinematicsConstraint_New.vi	public DifferentialDriveKinematicsConstraint(final DifferentialDriveKinematics kinematics, double maxSpeedMetersPerSecond)	

SwerveDriveKinematicsConstraint_getMinMaxAccel.vi

SwerveDriveKinematicsConstraint New.vi

TRAJECTORY CONSTRAINT

Interface class - nothing done (not needed)

XX

 $X \mid X$

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X SI

FRC_LabVIEW_Trajectory_Library_Routines.xlsx

poseMeters, double curvatureRadPerMeter, double

Newpublic SwerveDriveKinematicsConstraint(final

SwerveDriveKinematics kinematics, double

getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)

Can use cluster pack for now

velocityMetersPerSecond)

maxSpeedMetersPerSecond)

public MinMax

nple Program Not WPILIB

VI Name Function Prototype Notes Constraint MinMax New TRAJECTORY CONSTRAINT (Min Max) X X X SI X SI Constraint MinMax New.vi XX 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	Name Program	Function Prototype	Notes
UTIL	X	Χ	X	X			Util_Array_PoseWCurv_to_XY.vi		
	Χ	X	X	X	SI		Util_CalcDist.vi		
	Χ	X	X	X			Util_GetLibraryVersion.vi		
	X	X	X	X	SI		Util_GetLibraryUsage.vi		
	Χ	X	X	X			Util_GetTime.vi		Once tested completely, this should be optimized!
	X	Χ	Χ	No	N/A		Util_LibraryGlobals.vi		Global Variables – no block diag.
	Χ	X	X	X			Util_Trajectory_Absolute_To_Relative.vi		•
	Χ	X	X	X			Util_Trajectory_ReadFile.vi		
	Χ	X	X	X			Util_Trajectory_to_XY.vi		
	Χ	X	X	X			Util_Trajectory_WriteFile.vi		
	Χ	X	Χ	No			Util_Trajectory_WriteFile_Config.vi		internal
	Χ	Χ	X	No			Util_Trajectory_WriteFile_OneState.vi		internal
	Χ	Χ	X	X			Util_Trajectory_WriteFile_PathFinder.vi		
	Χ	Χ	X	No			Util_Trajectory_WriteFile_PathFinderConfig.vi		internal
	Χ	X	X	X			Util_Trajectory_WriteFile_Pathweaver.vi		
	Χ	X	X	No			Util_Trajectory_WriteFile_States.vi		internal
	X	Χ	Χ	No			Util_Trajectory_WriteFile_WayPoints.vi		internal
	X	X	X	X			Util_TrajectoryState_Meters_To_Inches.vi		
	X	Χ	Χ	Χ			Util_TrajState_to_DiffDrive_WheelPos.vi		
	X	X	Χ	X			Util_Waypoint_Eng_To_SI.vi		
	Χ	X	X	X			Util_Waypoint_To_CubicInput.vi		
	Χ	X	Χ	Χ			Util_Waypoint_To_QuinticInput.vi		
	Χ	Χ	X	No			Util_WeightedWayPoint_To_WeightedWayPoint.vi		Sorry about the confusing name

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CONVERSIONS

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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
CONV	Χ	Χ	Χ	Χ	SI			Conv_AngleDegrees_Heading.vi		
	Χ	Χ	Х	X	SI			Conv_AngleRadians_Heading.vi		
	Χ	Χ	Χ	Χ	SI			Conv_Centimeters_Meters.vi		

s st	II mis	ssing	one	۷۱)	Add	nai columns for test and sample.
	Χ	X	Χ	X	SI	Conv_Deg_Radians.vi
	Χ	X	Χ	X	SI	Conv_Feet_Meters.vi
	Χ	Χ	Χ	X	SI	Conv_GyroDegrees_Heading.vi
	Χ	Χ	Χ	X	SI	Conv_Heading_AngleRadians.vi
	Χ	X	Χ	X	SI	Conv_Inches_Meters.vi
	Χ	X	X	X	SI	Conv_Kilograms_Pounds.vi
	Χ	X	Χ	X	SI	Conv_Meters_Feet.vi
	X	X	X	X	SI	Conv_Meters_Inches.vi
	X	X	X	X	SI	Conv_POSE_SI_Eng.vi
	X	X	X	X	SI	Conv_Pounds_Kilograms.vi
	Χ	Χ	X	X	SI	Conv_Radians_Deg.vi
	Χ	Χ	Χ	X	SI	Conv_Yards_Meters.vi

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
UNITS	Χ	X		X				Units_DegreesToRadians.vi		
	Χ	Χ		X				Units_FeetToMeters.vi		
	Χ	X		X				Units_InchesToMeters.vi		
	Χ	X		X				Units_MetersToFeet.vi		
	Χ	X		X				Units_MetersToInches.vi		
	Χ	X		X				Units_RadiansPerSecondToRotationsPerMinute.vi		
	Χ	Χ		X				Units_RadiansToDegrees.vi		
	Χ	X		X				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	Function Prototype	Notes
PATHFINDERUTIL	Χ	Χ	X	X			PathfinderUtil_Continuous_Heading_Difference.vi		
	X	Χ	X	X			PathfinderUtil_OptimizeTrajectoryStates.vi		
	X	Χ	X	X			PathfinderUtil_ToTrajectory.vi		
	Χ	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	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
DC MOTOR	Χ	X		Χ	SI	DCMotor_GetAndymark9015.vi					
	Χ	Χ		Χ	SI	DCMotor_GetAndymarkRs775_125.vi					
	Χ	X		X	SI	DCMotor_GetBag.vi					
	Χ	Χ		X	SI	DCMotor_GetBanebotsRs550.vi					
	Χ	Χ		Χ	SI	DCMotor_GetBanebotsRs775.vi					

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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_GetVex775Pro.vi
X .	X		SI	DCMotor_GetRomiBuiltIn.vi
X .	X	X	SI	DCMotor_New.vi

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

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STATE SPACE ESTIMATION

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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimizea	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE POSE ESTIMATOR	X	X		X			DiffDrivePoseEst_AddVisionMeasurement.vi		Just a shell, not functional!			
	X	X		X			DiffDrivePoseEst_FillStateVector.vi					
	X	X		X			DiffDrivePoseEst_GetEstimatedPosition.vi					
	Χ			X			DiffDrivePoseEst_Kalman_F_Callback.vi					
	Χ			X			DiffDrivePoseEst_Kalman_H_Callback.vi					
	X	X		X			DiffDrivePoseEst_New.vi					
	Χ	X		X			DiffDrivePoseEst_ResetPosition.vi					
	X	X		X			DiffDrivePoseEst_SetVisionMeasurementStdDevs.vi					
	X	X		X			DiffDrivePoseEst_Update.vi					
	X	X		X			DiffDrivePoseEst_UpdateWithTime.vi					
	X	Χ					DiffDrivePoseEst_VisionCorrect_Callback.vi					
	X			X			DiffDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimize	Test Routine	Sample Program Ample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
EXTENDED KALMAN FILTER	$X \mid X$	X		X			ExtendedKalmanFilter_Correct.vi		Just a shell, not functional!			
	X	Χ		X			ExtendedKalmanFilter_Correct_OnlyUY.vi					
	X	Χ		X			ExtendedKalmanFilter_GetP.vi					
	X	Χ		Χ			ExtendedKalmanFilter_GetP_Single.vi					
	X	X		X			ExtendedKalmanFilter_GetXHat.vi					

on 2.X 11/12/2021 – State Space Items – (This list is s	n List	ssing on	e VI)	Added a	dditional columns for test and sample.	_				
	X	Χ	X		ExtendedKalmanFilter_GetXHat_Single.vi					
	X	X	X		ExtendedKalmanFilter_New.vi					
	Χ	X	X		ExtendedKalmanFilter_Predict.vi					
	Χ	Χ	X		ExtendedKalmanFilter_Reset.vi					
	Χ	X	X		ExtendedKalmanFilter_SetP.vi					
	Χ	X	X		ExtendedKalmanFilter_SetXHat.vi					
	Χ	X	X		ExtendedKalmanFilter_SetXHat_Single.vi					
	ited	ited IB	<u> </u>	n Optimized tine	rogram			view	Test Program	
	'mplemente	Documente Not WPILIB	Menu Item	Execution Op Test Routine	9			Rei	709	
	Jer	<i>E</i> ≥ <i>E</i>	nu	ocu st R	ຄວ ກ g n g NI Name			ge	<u>ل</u> ئ	
	шb	Š Š	Me	Ze Zes	້ອ່ VI Name	Function Prototype	Notes	Code	<i>T</i> es	
KALMAN FILTER	_	X	\overline{X}	X	KalmanFilter Correct.vi			Τ		Π
	X	X	X	X						
	X	X	X	X						
	X	X	X	7.	KalmanFilter Reset.vi					T
	X	X	X		KalmanFilter GetK					
	X	X	X		KalmanFilter GetK Single.vi					
	X	X	X		KalmanFilter SetXHat					
	X	X	X	X	KalmanFilter_SetXHat_Single					
	X	X	X		KalmanFilter_GetXHat					
	X	X	X	X	KalmanFilter GetXHaT Single					
			1 ×		raman noi_Gostiai_Gingle					
	mplemente	Documente Not WPILIB		Execution Op: Test Routine	96 P.			Revi	Test Progn	
KALMAN EUTER LATENOV COMPENSATOR	_	Doce		Exec Test	S VI Name	Function Prototype	Notes	Code	Test	
KALMAN FILTER LATENCY COMPENSATOR	$\frac{1}{X}$	Doce Not	X	Exec Test	KalmanFilterLatencyComp_AddObserverState.vi	Function Prototype	Notes Work in progress.	Code	Test	
KALMAN FILTER LATENCY COMPENSATOR	_	Doce		Exec Test		Function Prototype		Code	Test	
KALMAN FILTER LATENCY COMPENSATOR	$\frac{1}{X}$	Doc	X	Exec Test	KalmanFilterLatencyComp_AddObserverState.vi			Code	Test	
KALMAN FILTER LATENCY COMPENSATOR	X X X	Doc	X X X	Exec Test	KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v KalmanFilterLatencyComp_FindClosestMeasurement.vi		Work in progress.	Code	Test	
KALMAN FILTER LATENCY COMPENSATOR	X	Doci	X X X	Exec	KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_Observer_New.vi		Work in progress. Work in progress. Work in progress.	Code	Test	
KALMAN FILTER LATENCY COMPENSATOR	X X X X	Doci	X X X X	Exec	KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_Observer_New.vi		Work in progress. Work in progress. Work in progress.	Code	Test	
KALMAN FILTER LATENCY COMPENSATOR	X X X	Doci	X X X	Exec	KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v KalmanFilterLatencyComp_FindClosestMeasurement.vi		Work in progress. Work in progress.	Code	Test	
KALMAN FILTER LATENCY COMPENSATOR	X X X X	Doci	X		KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_Observer_New.vi KalmanFilterLatencyComp_Reset.vi KalmanFilterLatencyComp_New.vi		Work in progress. Work in progress. Work in progress. Work in progress.	Code	n Test	
KALMAN FILTER LATENCY COMPENSATOR	X X X X X X	ped No	X X X X X		KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_Observer_New.vi KalmanFilterLatencyComp_Reset.vi KalmanFilterLatencyComp_New.vi		Work in progress. Work in progress. Work in progress. Work in progress.	New	am:	
KALMAN FILTER LATENCY COMPENSATOR	X X X X X X	ped No	X X X X X		KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_Observer_New.vi KalmanFilterLatencyComp_Reset.vi KalmanFilterLatencyComp_New.vi		Work in progress. Work in progress. Work in progress. Work in progress.	Review	am:	
KALMAN FILTER LATENCY COMPENSATOR	X X X X X X	ped No	X X X X X		KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_Observer_New.vi KalmanFilterLatencyComp_Reset.vi KalmanFilterLatencyComp_New.vi		Work in progress. Work in progress. Work in progress. Work in progress.	le Review Code	am:	
KALMAN FILTER LATENCY COMPENSATOR	X X X X X X	ped No	X X X X X		KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_Observer_New.vi KalmanFilterLatencyComp_Reset.vi KalmanFilterLatencyComp_New.vi	vi	Work in progress.	code Review Code	am:	
	Implemented X X X X X	Documented Doci Not WPILIB Not	X	Execution Optimized Exec	KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_Observer_New.vi KalmanFilterLatencyComp_Reset.vi KalmanFilterLatencyComp_New.vi		Work in progress.	Code Review Code	Test Program Test	
KALMAN FILTER LATENCY COMPENSATOR	Implemented X X X X X X X X X	ped No	Wenu Item		KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_Observer_New.vi KalmanFilterLatencyComp_Reset.vi KalmanFilterLatencyComp_New.vi VI Name SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi	vi	Work in progress. Notes Haven't started yet	Code Review Code	am:	
	X X X X X X X X X X	ped No	X X X X X X X X X X X X X X X X X X X		KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_Observer_New.vi KalmanFilterLatencyComp_Reset.vi KalmanFilterLatencyComp_New.vi VI Name SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi	vi	Work in progress.	Code Review Code	am:	
	X X X X X X X X X X	ped No	X X X X X X X X X X X X X X X X X X X		KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_Observer_New.vi KalmanFilterLatencyComp_Reset.vi KalmanFilterLatencyComp_New.vi VI Name SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_VisionCorrect_Callback.vi	vi	Work in progress. Notes Haven't started yet	Code Review Code	am:	
	X X X X X X X X X X	ped No	X X X X X X X X X X X X X X X X X X X		KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_Observer_New.vi KalmanFilterLatencyComp_Reset.vi KalmanFilterLatencyComp_New.vi VI Name SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_VisionCorrect_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi	vi	Work in progress. Notes Haven't started yet	Code Review Code	am:	
	X X X X X X X X X X X X X X X X X X X	ped No	X X X X X X X X X X X X X X X X X X X		KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_Observer_New.vi KalmanFilterLatencyComp_Reset.vi KalmanFilterLatencyComp_New.vi VI Name SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_VisionCorrect_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi SwerveDrivePoseEst_Kalman_F_Callback.vi	vi	Work in progress. Notes Haven't started yet	Code Review Code	am:	
	X X X X X X X X X X X X X X X X X X X	ped No	X X X X X X X X X X X X X X X X X X X		KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_Observer_New.vi KalmanFilterLatencyComp_Reset.vi KalmanFilterLatencyComp_New.vi VI Name SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_VisionCorrect_Callback.vi SwerveDrivePoseEst_Kalman_F_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi	vi	Work in progress. Haven't started yet Haven't started yet	Code Review Code	am:	
	X X X X X X X X X X X X X X X X X X X	ped No	X X X X X X X X X X X X X X X X X X X		KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_Observer_New.vi KalmanFilterLatencyComp_Reset.vi KalmanFilterLatencyComp_New.vi VI Name SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_VisionCorrect_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_GetEstimatedPosition.vi	vi	Work in progress. Haven't started yet Haven't started yet Haven't started yet	Code Review Code	am:	
	X X X X X X X X X X X X X X X X X X X	ped No	X X X X X X X X X X X X X X X X X X X		KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_Observer_New.vi KalmanFilterLatencyComp_Reset.vi KalmanFilterLatencyComp_New.vi VI Name SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_VisionCorrect_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_GetEstimatedPosition.vi SwerveDrivePoseEst_New.vi	vi	Work in progress. Haven't started yet Haven't started yet Haven't started yet Haven't started yet Haven't started yet	Code Review Code	am:	
	X X X X X X X X X X X X X X X X X X X	ped No	X X X X X X X X X X X X X X X X X X X		KalmanFilterLatencyComp_AddObserverState.vi KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v KalmanFilterLatencyComp_FindClosestMeasurement.vi KalmanFilterLatencyComp_Observer_New.vi KalmanFilterLatencyComp_Reset.vi KalmanFilterLatencyComp_New.vi VI Name SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi SwerveDrivePoseEst_AddVisionMeasurement.vi SwerveDrivePoseEst_VisionCorrect_Callback.vi SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi SwerveDrivePoseEst_Kalman_H_Callback.vi SwerveDrivePoseEst_GetEstimatedPosition.vi	vi	Work in progress. Haven't started yet Haven't started yet Haven't started yet	Code Review Code	am:	

X	X	Swervel	veDrivePoseEst_Update.vi	Haven't started yet
X	X	Swervel	veDrivePoseEst_UpdateWithTime.vi	Haven't started yet
				Haven't started yet

	Implemented	Documented	NOC WITTED	Menu Item Execution Optimized	est	8	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
UNSCENTED KALMAN FILTER	X			X			UnscentedKalmanFilter_Correct.vi		Work in progress.			
	X			X			UnscentedKalmanFilter_Correct_FuncGroup.vi					
	X		_ 2	X			UnscentedKalmanFilter_Correct_OnlyUY.vi					
	X			X			UnscentedKalmanFilter_Correct_OnlyUYR.vi					
		X	_	X			UnscentedKalmanFilter_GetP.vi					
		X	-	X			UnscentedKalmanFilter_GetP_Single.vi					
		X		X			UnscentedKalmanFilter_GetXHat.vi					
		X	-	X			UnscentedKalmanFilter_GetXHat_Single.vi					
	X			X			UnscentedKalmanFilter_New.vi					
	Χ		_	X			UnscentedKalmanFilter_New_Default.vi					
	Χ			X			UnscentedKalmanFilter_New_FuncGroup.vi					
		X		X			UnscentedKalmanFilter_Predict.vi					
		X	-	X			UnscentedKalmanFilter_Reset.vi					
		X	_	X			UnscentedKalmanFilter_SetP.vi					
		X		X			UnscentedKalmanFilter_SetXHat.vi					
		X	-	X			UnscentedKalmanFilter_SetXHat_Single.vi					
	X		_ -	X			UnscentedKalmanFilter_Transform.vi					

'======== STATE SPACE CONTROL '========

Function Prototype Notes CONTROL AFFINE PLANT INVERSION FEEDFORWARD

X Menu Item Function Prototype Notes LINEAR PLANT INVERSION FEEDFORWARD X X LinearPIntInvFF_Calculate.vi X X X X X X Х LinearPIntInvFF_Calculate_NextR.vi Χ LinearPIntInvFF_GetUff.vi Χ LinearPIntInvFF_New.vi XX Χ LinearPIntInvFF New Plant.vi XX Χ LinearPIntInvFF Reset Initial.vi X X X X X LinearPIntInvFF_Reset_Zero.vi LinearPIntInvFF_GetUff_Single.vi X X X X X LinearPIntInvFF GetR.vi LinearPIntInvFF_GetR_Single.vi

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

Test Routine ple Progr Vot WPILIB Menu Item Function Prototype Notes LINEAR QUADRATIC REGULATOR X X Χ LinearQuadraticRegulator Calculate NextR.vi X X X X Χ LinearQuadraticRegulator Calculate.vi Χ LinearQuadraticRegulator_GetK_Single.vi NOT ORIGINAL. X X X X Χ LinearQuadraticRegulator GetK.vi Χ LinearQuadraticRegulator GetR Single.vi X XΧ LinearQuadraticRegulator GetR.vi X X Χ LinearQuadraticRegulator GetU Single.vi XX X LinearQuadraticRegulator GetU.vi X LinearQuadraticRegulator LatencyCompensate.vi Routine exists, but it only has interger raise matrix to power. LinearQuadraticRegulator_New_ELMS.vi XX Χ LinearQuadraticRegulator New Raw.vi XX X LinearQuadraticRegulator New SystemELMS.vi Χ LinearQuadraticRegulator New N.vi XX Χ LinearQuadraticRegulator New.vi XX Χ LinearQuadraticRegulator Reset.vi Execution Optimized X Menu Item **Function Prototype** Notes LINEAR SYSTEM X X LinearSystem CalculateX.vi Χ XX LinearSystem_CalculateY.vi XX X LinearSystem GetA.vi Χ XX LinearSystem GetAElement.vi X XX LinearSystem GetB.vi XX Χ LinearSystem GetBElement.vi XX Χ LinearSystem_GetC.vi Χ XX LinearSystem GetCElement.vi XX X LinearSystem GetD.vi XX X LinearSystem GetDElement.vi XX Χ LinearSystem_New.vi Execution Optimized Function Prototype Notes LINEAR SYSTEM LOOP X X X LinearSystemLoop_ClampInput.vi Χ XX LinearSystemLoop_Correct.vi LinearSystemLoop_GetClampFunction.vi X X Χ LinearSystemLoop_GetController.vi XX Χ LinearSystemLoop GetError Single.vi Χ XX LinearSystemLoop GetError.vi Χ XX LinearSystemLoop GetFeedForward.vi XX Χ LinearSystemLoop GetNextR Single.vi

Still miss	sing o	ne vi)	Adde	ea aa	iditional columns for test and sample.
X .	X	X			LinearSystemLoop_GetNextR.vi
X .	X	X			LinearSystemLoop_GetObserver.vi LinearSystemLoop_GetObserver.vi
X .	X	X			LinearSystemLoop_GetU_Row.vi
X .	X	X			LinearSystemLoop_GetU.vi
X .	X	X			LinearSystemLoop_GetXHat_Single.vi
X .	X	X			LinearSystemLoop_GetXHat.vi
					LinearSystemLoop_New_BBB
					LinearSystemLoop_New_LinearSystem_ClampFunc
X .	X	X			LinearSystemLoop_New_LinearSystem_ClampVal.vi
X .	X	X			LinearSystemLoop_New.vi
X .	X	X			LinearSystemLoop_Predict.vi LinearSystemLoop_Predict.vi
X .	X	X			LinearSystemLoop_Reset.vi
					LinearSystemLoop_SetClampFunction.vi
					LinearSystemLoop_SetNextR_Some.vi
X .	X	X			LinearSystemLoop_SetNextR.vi
					LinearSystemLoop_SetXHat_Single.vi
					LinearSystemLoop_SetXHat.vi

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

CALLBACK HELPER		Documented	X Not WPILIB	X Menu Item	Execution Optimized	Test Routine	CallbackHelp_MatrixMinus.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	Χ		Χ	X			CallbackHelp_MatrixMult.vi					
	Χ		X	Χ			CallbackHelp_MatrixMult_CoerceSizeB.vi					
	Χ		Χ	Χ			CallbackHelp_MatrixPlus.vi					
DISCRETIZATION	X	X X Documented X X	Not WPILIB	X X Menu Item	Execution Optimized	X X Test Routine	VI Name Discretized.vi Discretization_DiscretizeA.vi Discretization_DiscretizeAB.vi Discretization_DiscretizeABTaylor.vi Discretization_DiscretizeAQ.vi Discretization_DiscretizeAQTaylor.vi Discretization_DiscretizeR.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
STATE SPACE UTIL		X X Documented	Not WPILIB	X X Menu Item	Execution Optimized	X X Test Routine	VI Name StateSpaceUtil_MakeCostMatrix.vi StateSpaceUtil_MakeCovarianceMatrix.vi StateSpaceUtil_MakeWhiteNoiseVector.vi StateSpaceUtil_IsStabalizable.vi StateSpaceUtil_PoseToVector.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking

			and additional obtaining to tool and oampio.			
X	X	X	StateSpaceUtil_ClampInputMaxMagnitude.vi	Routine exists, it is just a shell		
X	X	X	StateSpaceUtil_NomalizeInputVector.vi			
X	X	X	StateSpaceUtil_PoseTo4dVector.vi			
X	X	X	StateSpaceUtil_PoseTo3dVector.vi			

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

molemented	mplemented	Not WPILIB	Menu Item	Execution Optimized	Test Routine Sample Program <	/I Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
BATTERY SIM >	γ λ	(X		В	BatterySim_CalculateDefaultBatteryLoadedVoltage.vi					
	γ λ	(X			BatterySim_CalculateLoadedVoltage.vi					

	Implemented	Documented Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE TRAIN SIM	X					DiffDriveTrainSim_ClampInput.vi					
	X		X			DiffDriveTrainSim_CreateKitbotSim.vi					
	X		X			DiffDriveTrainSim_CreateKitbotSim_EstMass.vi					
	X		X			DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi					
	X		X			DiffDriveTrainSim_GetCurrentDrawAmps.vi					
	X		X			DiffDriveTrainSim_GetCurrentGearing.vi					
	X		X			DiffDriveTrainSim_GetDynamics.vi					
	X		X			DiffDriveTrainSim_GetHeading.vi					
	X		X			DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi					
	X		X			DiffDriveTrainSim_GetLeftPositionMeters.vi					
	X		X			DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi					
	X		X			DiffDriveTrainSim_GetOutput_Single.vi					
	X		X			DiffDriveTrainSim_GetPose.vi					
	X		X			DiffDriveTrainSim_GetRightCurrentDrawAmps.vi					
	X		X			DiffDriveTrainSim_GetRightPositionMeters.vi					
	X		X			DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi					
	X		X			DiffDriveTrainSim_GetState.vi					
	X		X			DiffDriveTrainSim_GetState_Single.vi					
	X		X			DiffDriveTrainSim_KitBotWheelSize.vi					
	X		X			DiffDriveTrainSim_New.vi					
	X		X			DiffDriveTrainSim_New_Mass_MOI.vi					
	X		X			DiffDriveTrainSim_SetCurrentGearing.vi					
	X		X			DiffDriveTrainSim_SetInputs.vi					
	X		X			DiffDriveTrainSim_SetPose.vi					
	X		X			DiffDriveTrainSim_SetState.vi					
	X		X			DiffDriveTrainSim_ToughBoxMiniGearRatio.vi					
	X		X			DiffDriveTrainSim_ToughBoxMiniMotor.vi					
	X		X			DiffDriveTrainSim_Update.vi					

FRC LabVIEW Trajectory Library – VI Implementation	n List	t									
Revision 2.X 11/12/2021 – State Space Items – (This list is s	still mi	issing on	ne VI) Ad	ded ad	ditional columns for test and sample.					
				ıize		2					
	75	75		ptin	a)	grar			>	£	ing
	ntec	ntec	<u>α</u>	, d	Test Routine	Prog			viel	Test Program	eck
	Implemente	Documente	NOT WFILIE	Execution	Rol	S VI Name			. Revi	Pro	S
	ηρle	7	010	xec	est	de VINI	Formation Double to a	Nistan	Code	est	ror
ELEVATOR SIM		Q		<u>ч</u>		S VI Name ElevatorSim New.vi	Function Prototype	Notes		<u> </u>	
ELLVATOROIM	X			(ElevatorSim GetCurrentDraw.vi					
	Χ		\ \ \ \ \ \	(ElevatorSim_GetPositionMeters.vi					
	Χ			(ElevatorSim_GetVelocityMetersPerSecond.vi					
	X			(ElevatorSim_SetInputVoltage.vi					
	X			(ElevatorSim_UpdateX.vi ElevatorSim_WouldHitLowerLimit.vi					
	X		$\frac{1}{\lambda}$			ElevatorSim_WouldHitUpperLimit.vi					
	X	>	XX	(ElevatorSim_Update.vi		Needed because this doesn't			
								extend.			
	X			(ElevatorSim_HasHitLowerLimit.vi					
	X	\	X X			ElevatorSim_HasHitUpperLimit.vi ElevatorSim_RKF45_Func.vi					
		,				ElevatorSim New NoNoise.vi					
						ElevatorSim_New_LinSys.vi					
						ElevatorSim_New_LinSys_NoNoise.vi					
	Implemented	Documented	NOT WPILIB	Execution Optimize	Test Routine	Sample Program	Function Prototype	Notes	Code Review	Test Program	error Checking
FLYWHEEL SIM		0 2		<u>е</u> Ш	<u> </u>	FlyWheelSim_GetAngularVelocityRadPerSec.vi	Function Prototype	Notes			Ш
	X			(FlyWheelSim New MOI.vi					
	Χ		\ \ \ \ \ \	(FlyWheelSim_SetInput.vi					
	X			(FlyWheelSim_Update.vi					
	X			(FlyWheelSim_GetCurrentDrawAmps					
	Χ			(FlyWheelSim_GetAngularVelocityRPM.vi		Future			
						FlyWheelSim_New_LinSys_NoNoise FlyWheelSim_New_LinSys		Future			
						FlyWheelSim_New_LinSys_MOI_NoNoise		Future			
	ď	ď		Optimized	ø,	gram			8	٤	ing
	nte	nte	ַב בַּ		utin	Prog			e Viê	gra	ech
	me	ime id	1 4	utio	Rol	e/c			Å.	Progra	S
	əJdι	000	NOT WPILIE	Execution	Test Routine	S VI Name	5 . C . D	NI 4	oqe	Test	Ď.
LINEAR SYSTEM SIM	<u> </u>	ک ک		<u>Σ</u> <u>Ψ</u>	<u> </u>	ップ VI Name LinearSystemSim_GetOutput.vi	Function Prototype	Notes	8	\	Eu
LINEAR STSTEM SIM	X			(LinearSystemSim_GetOutput_Vi LinearSystemSim_GetOutput_Single.vi					
	X		7	(LinearSystemSim_New					
	Χ		\ \ \ \ \ \	(LinearSystemSim_SetInput_Single.vi					
	Χ		λ	(LinearSystemSim_Update.vi					
	X		N	0		LinearSystemSim_UpdateX.vi					
	Χ)	X N	U		LinearSystemSim_UpdateY.vi LinearSystemSim_New_NoNoise.vi					
	Х		 	(LinearSystemSim_New_Nonoise.vi LinearSystemSim_SetInput.vi					
	X		λ	(LinearSystemSim_SetInput_Array.vi		Doesn't use clamp ?			
	Χ			(LinearSystemSim_Setstate.vi					
			\perp			LinearSystemSim_GetCurrentDrawAmps.vi		DONT IMPLEMENT			
	Χ					LinearSystemSim_ClampInput.vi					

	Implemented		Not W	Menu Item	Execution Optimized Test Routine	· ·	Function Prototype	Notes	Code Review	Test Program	Error Checking
SINGLE JOINT ARM SIM	X			X		SngJntArmSim_EsitmateMOI.vi					
	X	Χ		X		SngJntArmSim_GetAngleRads.vi					
	X	Χ		X		SngJntArmSim_GetCurrentDraw.vi					
	X	Χ		X		SngJntArmSim_GetVelocityRadsPerSec.vi					
	X	Χ		X		SngJntArmSim_HasHitLowerLimit.vi					
	X	Χ		X		SngJntArmSim_HasHitUpperLimit.vi					
	X	X		X		SngJntArmSim_New.vi					
	X	Χ				SngJntArmSim_Rkf45_Func.vi					
	X	Χ		X		SngJntArmSim_SetInputVoltage.vi					
	X			X		SngJntArmSim_Update.vi					
	X	X		X		SngJntArmSim_UpdateX.vi					
	Χ	Χ		X		SngJntArmSim_WouldHitLowerLimit.vi					
	X	Χ		X		SngJntArmSim_WouldHitUpperLimit.vi					
										í l	

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

> Function Prototype Notes MAT BUILDER X MatBuilder Fill.vi SI X SI MatBuilder_Create.vi

	Implemented	Documented	Menu Item	Execution Optim	Test Routine Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATRIX	X	X	X			Matrix_AssignBlock.vi					
		X	X			Matrix_Block.vi					
		X	X			Matrix_Create.vi					
		X	X			Matrix_Diag.vi					
		X	X			Matrix_ElementSum.vi					
		X	X			Matrix_Exp.vi					
	-	X	X	_		Matrix_ExtractColumnVector.vi					
		X	X			Matrix_ExtractFrom.vi					
	Χ		X			Matrix_ExtractMatrix.vi					
		X	X			Matrix_ExtractRowVector.vi					
		X	X			Matrix_Fill.vi					
		X	X			Matrix_Ident.vi					
		X	X			Matrix_IsEqual.vi					
		X	X			Matrix_LItDecompose.vi					
		X	X			Matrix_Pow.vi					
		X	X			Matrix_SetColumn.vi					
	X	X	X			Matrix_SetRow.vi	THERE ARE LOTS OF OTHER MATRIX FUNCTIONS THAT SHOULD BE INCLUDED HERE FOR ISOLATION.				

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	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATRIX HELPER	X		Χ	X	SI		MatrixHelper_Zero.vi					
	Χ		X	Χ	SI		MatrixHelper_CooerceSize.vi					
	Χ		Χ	X	SI		MatrixHelper_MultCooerceBSize.vi					

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

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

> Sample Progr X Menu Item Function Prototype Notes ANGLE STATISTICS X X AngleStats_AngleAdd.vi AngleStats_AngleAdd_CallbackHelp.vi AngleStats_AngleMean.vi Χ AngleStats_AngleMean_CallbackHelp.vi
> AngleStats_AngleResidual.vi X X X X XX X Χ X X X X AngleStats AngleResidual CallbackHelp.vi

VIEW Trajectory Library – VI Implementation .X 11/12/2021 – State Space Items – (This list is sti	ill missin	g one	VI) A	dded ad	dditional columns for test and sample.			
	XX		X		MathUtil_Clamp.vi			
	XX		X		MathUtil_ApplyDeadband.vi			
	XX		X		MathUtil_Clamp_Int.vi			
	XX		X		MathUtil_InputModulus.vi			
	Implemented Documented	Not WPILIB	Menu Item	Execution Optimized Test Routine	nple Program	e Review	Test Program	
	np 20C	Vot	Jen Jen	esi xe	VI Name Function Prototype Notes	Cod	esi	, 1
MERWE SCALED SIGMA POINTS			X	<u> </u>	MerweScSigPts_ComputeWeights.vi			
	X X		X		MerweScSigPts_GetNumSigmas.vi			
	X X X X X X		X		MerweScSigPts_GetWc.vi			
	$\begin{array}{c c} X & X \\ \hline X & X \end{array}$		X		MerweScSigPts_GetWc_Single.vi			
	$\begin{array}{c c} X & X \\ \hline X & X \end{array}$		X		MerweScSigPts GetWm.vi			
			X					
					MerweScSigPts_GetWm_Single.vi			
	XX		X		MerweScSigPts_New.vi		+	
	XX		X		MerweScSigPts_New_Default.vi			
_	X X		X		MerweScSigPts_SigmaPoints.vi			
	ner	71,	Iter	log ino	e Po	Rev	rog	i
NUMERICAL INTEGRATION		Not WPILIB	o Menu Item	Test Routine	VI Name Function Prototype NumIntegrate_Func_Ax_Bu_K.vi	Code Revi	Test Program	2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
NUMERICAL INTEGRATION	X X	Not WPIL	No No	Test Roul	VI Name Function Prototype Notes NumIntegrate_Func_Ax_Bu_K.vi NumIntegrate_Func_Bs.vi	Code Rev	Test Prog	
NUMERICAL INTEGRATION	X X X X	Not WPIL	No No No	Execution Test Roui	VI Name Function Prototype Notes NumIntegrate_Func_Ax_Bu_K.vi NumIntegrate_Func_Bs.vi NumIntegrate_Func_Ch.vi	Code Rev	Test Prog	
NUMERICAL INTEGRATION	X X	Not WPIL	No No No	Test Roui	VI Name Function Prototype Notes NumIntegrate Func Ax Bu K.vi NumIntegrate Func Bs.vi NumIntegrate Func Ch.vi NumIntegrate Func Ct.vi	Code Rev	Test Prog	
NUMERICAL INTEGRATION	X X X X	Not WPIL	No No No No X	Test Roui	VI Name Function Prototype Notes NumIntegrate_Func_Ax_Bu_K.vi NumIntegrate_Func_Bs.vi NumIntegrate_Func_Ch.vi NumIntegrate_Func_Ct.vi NumIntegrate_Rk4_Dbl.vi NOT DONE	Code Rev	Test Prog	
NUMERICAL INTEGRATION	X X X X Y / /	Not WPIL	No No No X X	Test Rou	VI Name Function Prototype Notes 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_K_Dbl.vi Not Done	Code Rev	Test Prog	
NUMERICAL INTEGRATION	X X X X Y / /	Not WPIL	No No No X X	Test Rou	VI Name Function Prototype Notes NumIntegrate Func_Ax_Bu_K.vi NumIntegrate Func_Bs.vi NumIntegrate Func_Ch.vi NumIntegrate Func_Ct.vi NumIntegrate Rk4_Dbl.vi NumIntegrate Rk4_K_Dbl.vi NumIntegrate Rk4_Mat_X.vi	Code Rev	Test Prog	
NUMERICAL INTEGRATION	X	Not WPIL	No	Test Rou	VI Name Function Prototype Notes NumIntegrate Func Ax Bu K.vi NumIntegrate Func Bs.vi NumIntegrate Func Ch.vi NumIntegrate Func Ct.vi NumIntegrate Rk4 Dbl.vi NumIntegrate Rk4 K Dbl.vi NumIntegrate Rk4 Mat X.vi NumIntegrate Rk4 Mat X.vi NumIntegrate Rk4 Mat X.vi	Code Rev	Test Prog	
NUMERICAL INTEGRATION	X X X X Y / / X X X	Not WP/L	No	Test Rou	VI Name Function Prototype Notes NumIntegrate Func Ax_Bu_K.vi NumIntegrate Func Bs.vi NumIntegrate Func Ch.vi NumIntegrate Func Ct.vi NumIntegrate Rk4_Dbl.vi NumIntegrate Rk4_K_Dbl.vi NumIntegrate Rk4_Mat_X.vi NumIntegrate Rk4_Mat_X_U.vi NumIntegrate Rk645.vi	Code Rev	Test Prog	
NUMERICAL INTEGRATION	X X X X Y Y X X X X	Not WP/L	No	Test Rou	VI Name Function Prototype Notes 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_K_Dbl.vi NumIntegrate_Rk4_Mat_X.vi NumIntegrate_Rk4_Mat_X.vi NumIntegrate_Rk4_Mat_X_U.vi NumIntegrate_Rk45.vi NumIntegrate_Rk45Impl.vi	Code Rev	Test Prog	
NUMERICAL INTEGRATION	X	Not WPIL	No	Test Rou	VI Name Function Prototype Notes NumIntegrate Func Ax Bu K.vi NumIntegrate Func Bs.vi NumIntegrate Func Ch.vi NumIntegrate Func Ct.vi NumIntegrate Func Ct.vi NumIntegrate Rk4_Dbl.vi NumIntegrate Rk4_K Dbl.vi NumIntegrate Rk4_Mat X.vi NumIntegrate Rk4 Mat X.vi NumIntegrate Rk4 Mat X U.vi NumIntegrate Rk45.vi NumIntegrate Rk45lmpl.vi NumIntegrate Rk45lmpl.vi NumIntegrate Trap_Dbl.vi	Code Rev	Test Prog	
NUMERICAL INTEGRATION	X X X X Y Y X X X X	Not WPIL	No	Test Rou	VI Name Function Prototype Notes 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_K_Dbl.vi NumIntegrate_Rk4_Mat_X.vi NumIntegrate_Rk4_Mat_X.vi NumIntegrate_Rk4_Mat_X_U.vi NumIntegrate_Rk45.vi NumIntegrate_Rk45Impl.vi	Code Rev	Test Prog	
NUMERICAL INTEGRATION	X		No	Described	VI Name Function Prototype Notes NumIntegrate Func Ax Bu K.vi NumIntegrate Func Bs.vi NumIntegrate Func Ch.vi NumIntegrate Func Ct.vi NumIntegrate Func Ct.vi NumIntegrate Rk4_Dbl.vi NumIntegrate Rk4_K Dbl.vi NumIntegrate Rk4_Mat X.vi NumIntegrate Rk4 Mat X.vi NumIntegrate Rk4 Mat X U.vi NumIntegrate Rk45.vi NumIntegrate Rk45lmpl.vi NumIntegrate Rk45lmpl.vi NumIntegrate Trap_Dbl.vi	view Code		
NUMERICAL INTEGRATION	X		No	Described	NumIntegrate Func Ax Bu K.vi NumIntegrate Func Bs.vi NumIntegrate Func Ct.vi NumIntegrate Rk4_Dbl.vi NumIntegrate Rk4_K Dbl.vi NumIntegrate Rk4_K Dbl.vi NumIntegrate Rk4_Mat X.vi NumIntegrate Rk4_Mat X_Uvi NumIntegrate Rk4_Mat X_Uvi NumIntegrate Rk4-Ni NumIntegrate Trap_Dbl.vi NumIntegrate Trap_Mat.vi	view Code		
NUMERICAL INTEGRATION	Implemented X X X X X X X X X X X X X X X X X X X	Not WPILIB	No No No No X X X X X X X X X X X X X X	Test Routine Test Routine	VI Name Function Prototype Notes	Code Review Code	Test Program Test Prog	
NUMERICAL INTEGRATION	Implemented X X X X X X X X X X X X X X X X X X X	Not WPILIB	No	Described	Numintegrate Func Ax_Bu_K.vi Numintegrate Func Bs.vi Numintegrate Func Ct.vi Numintegrate Rk4_Dbl.vi Numintegrate Rk4_Dbl.vi Numintegrate Rk4_Mat_X.vi Numintegrate Rk4_Mat_X.vi Numintegrate Rk4_Mat_X.vi Numintegrate Rk4_Mat_X.vi Numintegrate Rk4_Si.vi Numintegrate Rk4_Si.vi Numintegrate Rk4_Si.vi Numintegrate Rk4_Si.vi Numintegrate Trap_Dbl.vi Numintegrate Trap_Mat.vi Function Prototype Notes Notes Notes	Code Review Code		
NUMERICAL INTEGRATION	Implemented X X X X X X X X X X X X X X X X X X X	Not WPILIB	No No No No X X X X X X X X X X X X X X	Described	VI Name Function Prototype Notes	Code Review Code		

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	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
RICCAT	/			Χ				Riccati_Check_Detectable.vi		Routine exists, it is just a shell			
	/			Χ				Riccati_Check_Stabilizable.vi		Not really done !!!			
	Χ	X		X		Χ		Riccati_DARE.vi					
	X			X		Χ		Riccati_DARE_Iterate.vi					
	X	X		X				Riccati_DARE_N.vi					
	X			X				Riccati_Input_Check.vi					

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

> 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 Z X X N/A DCMOTOR.CTL Z X X X N/A DIFF DRIVE KINEMATICS.CTL X X N/A DIFF DRIVE Kitbot WheelSize ENUM.ctl Ζ 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 DIFF_DRIVE_TRAIN SIM.ctl X X N/A Ζ X X N/A ELEVATOR SIM.CTL Ζ X X N/A ELEV FF.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.ctl Ζ X X N/A KALMAN FILTER LATENCY COMP.CTL Z X X X N/A LINEAR FILTER.CTL X X N/A Ζ LINEAR PLANT INV FF.ctl X X N/A LINEAR QUADRATIC REGULATOR.ctl Ζ Ζ X X N/A LINEAR SYSTEM LOOP.ctl Ζ X X N/A LINEAR SYSTEM SIM.ctl X X N/A LINEAR_SYSTEM.ctl Z X X X N/A MECA_DRIVE_KINEMATICS.CTL Z X X X N/A MECA_DRIVE_ODOMETRY.CTL Z X X X N/A MECA_WHEEL_SPEEDS.CTL Z X X N/A MEDIAN_FILTER.CTL Ζ X X N/A MERWE_SCALED_SIGMA_PTS.ctl Ζ X X N/A OBSERVER SNAPSHOT.CTL X X N/A OBSERVER_SNAP_LIST_ITEM.CTL Z X X X N/A PARAM STACK ITEM.CTL Z X X X N/A PARAM STACK.CTL PID ADV_LIMITS.CTL X X N/A Z X X N/A PID ADV TUNING.CTL

still m	issing	one \	/l)	Added addition	onal columns for test and sample.	
Z		Χ			PID CONTROLLER.CTL	
Z		Χ	Χ	N/A	PID ERROR TOLERANCE.CTL	
Z		Χ	Χ		PID INPUT LIMITS.CTL	
Z		Χ	X		PID TUNING.CTL	
Z	Χ		X		POSE2D.CTL	
Z	X	X	X		POSEwCURVATURE.CTL	
Z		X	X		PROFILED PID CONTROLLER.CTL	
Z	Х		X		RAMSETE.CTL	
Z	X	X	X		ROTATION2D.CTL	
Z		X	X		SINGLE_JOINT_ARM_SIM.CTL	
Z	X		X		SIMPLE MOTOR FF.CTL	
Z		X	X		SLEW RATE LIMITER.CTL	
Z	X	X	X		SPLINE_CTRL_VECTOR.CTL	
Z	X	X	X		SPLINE.CTL	
Z	X	X	X		SWERVE_DRIVE_KINEMATICS.CTL	
Z	X	X	\hat{x}		SWERVE DRIVE MODULE STATE.CTL	
Z	\hat{X}	X	\hat{x}		SWERVE DRIVE ODOMETRY.CTL	
Z	^	^	X		SWERVE DRIVE POSE EST.CTL	
Z		Х	\hat{X}		TIMER.CTL	
_	~		\hat{X}		TRAJ CONFIG.CTL	
Z	X		X		TRAJ_CONFIG.CTL TRAJ_CONSTRAINT_CENTRIPETAL_ACCEL.CTL	
Z	X	X	X		TRAJ_CONSTRAINT_CENTRIPETAL_ACCEL.CTL TRAJ_CONSTRAINT_DIFF_DRIVE_KINEMATICS.CTL	
Z	X		X			
Z	X	X			TRAJ_CONSTRAINT_DIFF_DRIVE_VOLTAGE.CTL TRAJ_CONSTRAINT_JERK.CTL	Davida asida ikisisaka aball
1	V	X		N/A		Routine exists, it is just a shell
Z	X	X	X		TRAJ_CONSTRAINT_MECA_DRIVE_KINEMATICS.CTL	
Z	X	X	X		TRAJ_CONSTRAINT_MINMAX.CTL	
Z	X	X		N/A	TRAJ_CONSTRAINT_SWERVE_DRIVE_KINEMATICS.CTL	
Z	X	X	X		TRAJ_STATE.CTL	
Z	X	X	Χ		TRAJECTORY.CTL	
Z	X	X	Χ		TRANSFORM2D.CTL	
Z	Χ	Χ	Χ		TRANSLATION2D.CTL	
Z		Χ	Χ		TRAPEZOID_PROFILE_CONSTRAINT.CTL	
Z		Χ	Χ		TRAPEZOID_PROFILE_STATE.CTL	
Z		Χ	Χ		TRAPEZOID_PROFILE.CTL	
Z	Χ		Χ		TWIST2D.CTL	
Z		Χ	Χ		UNSCENTED_KALMAN_FILTER.ctl	
Z		Χ	Χ		UNSCENTED_KALMAN_NEW_FUNC_GROUP.CTL	
Z		Χ	Χ		UNSCENTED_KALMAN_CORRECT_FUNC_GROUP.CTL	
Ζ	X	X	Χ		UTIL_PATHFINDER_CONFIG.CTL	
Ζ	X	Χ	Χ		UTIL_WAYPOINT.ctl	
Z		Χ	Χ	NA	UTIL_WEIGHTED_WAYPOINT.ctl	New V1.5
N/A		N/A		N/A	WAYPOINTS.CTL	Delete – obsolete
Ζ		Χ	Χ	NA	WEIGHTED_WAYPOINT.CTL	New V1.5
N/A		N/A		N/A	X Y HEADINGS.CTL	Delete – obsolete