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

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

VI / CTL Totals
VI Total
CTL Totals
VI Total
CTL Total
VI Shell Total
VI Shell Total
CTRL Shell Total
3

Doc completed Pct 54.79%
Optimization Pct 31.76%

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

'===== BASE

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									•	
LINEAR FILTER	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 X X	X X X X S Execution Optimized	Test Routine	Sample Program	VI Name LinearFilter_Calculate.vi LinearFilter_CutoffFrequency.vi LinearFilter_Execute.vi LinearFilter_HighPass.vi LinearFilter_HighPassBW1.vi LinearFilter_HighPassBW2.vi	Function Prototype	Notes Labview style helper
	X	X	X	X	X			LinearFilter_LowPassBW1.vi		
_	X	X	Χ		X			LinearFilter_LowPassBW2.vi		
	X	X		X	X			LinearFilter_MovingAverage.vi LinearFilter New.vi		
	X	X		X	I SI			LinearFilter_New.vi LinearFilter_Reset.vi		
-	X	X	X		SI			LinearFilter_ResetToValue.vi		
-	X	X	^	X	X			LinearFilter_SinglePoleIIR.vi		
-	X	\hat{x}	Χ		X			LinearFilter TimeConst.vi		
L	^							Linear liter_TimeConst.vi		
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
MEDIAN FILTER		\overline{x}		X	X			MedianFilter Calculate.vi		
	X	X	X					MedianFilter_Execute.vi		Labview style helper
	X	X		X	SI			MedianFilter_New.vi		, , ,
	Χ	X		X	SI			MedianFilter_Reset.vi		
	Χ	Χ	Χ	X	SI			MedianFilter_ResetToValue.vi		

FRC_LabVIEW_Trajectory_Library_Routines.xlsx

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimizec	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TIMER		X	X	X				Timer_Close.vi		releases semaphore
	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				Timer_HasPeriodPassedOnce.vi		
	Χ	X		X				Timer_New.vi		
	Χ	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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ADM FF	< Implemented	Documented	Not WPILIB	Menu Item	Execution Optimize	Test Routine	Sample Program	Function Prototype	Notes
ARM FF	^	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
	Χ	Χ		Χ			ArmFF_MaxAchieveAccel.vi		
	Χ	Χ		Χ			ArmFF_MaxAchieveVelocity.vi		
	Χ	Χ		Χ			ArmFF_MinAchieveAccel.vi		
	X	X		X			ArmFF_MinAchieveVelocity.vi		
	Χ	Χ		Χ			ArmFF_New.vi		
	Χ	X		Χ			ArmFF_New_ZeroGravity.vi		

FRC_LabVIEW_Trajectory_Library_Routines.xlsx

Revision 2.X 11/12/2021 – State Space Items – (This list is still missing one VI....) Added additional columns for test and sample. nple Program Vot WPILIB VI Name Function Prototype Notes CONTROLLER UTIL X ControllerUtil GetModulusError.vi This was short lived in WPILIB, but still useful here. VI Name **Function Prototype** Notes ELEV FF X X ElevFF Calculate.vi X XX ElevFF CalculateVelocityOnly.vi X ElevFF Execute.vi LabVIEW style single call Χ ElevFF_ExecuteVelocityOnly.vi LabVIEW style single call X X ElevFF_MaxAchieveAccel.vi Χ XX ElevFF_MaxAchieveVelocity.vi Χ XX X ElevFF_MinAchieveAccel.vi ElevFF_MinAchieveVelocity.vi XX Χ XX X ElevFF_New.vi XX X ElevFF New ZeroAccel.vi VI Name **Function Prototype** Notes HOL DRV CTRL X HolDrvCtrl AtReference.vi Added 1/26/21 X HolDrvCtrl Calculate.vi Χ Added 1/26/21 X HolDrvCtrl Calculate Trajectory.vi Added 1/26/21 HolDrvCtrl Execute.vi Χ Future HolDrvCtrl Execute Trajectory.vi Χ Future Χ Added 1/26/21 HolDrvCtrl New.vi Χ HolDrvCtrl SetEnabled.vi X Added 1/26/21 Χ HolDrvCtrl SetTolerance.vi Added 1/26/21 nple Progr Not WPILIB Menu Item Function Prototype Notes PID CONTROLLER X X XX PIDController_AdvCalculate_FF_Sp_Pv.vi Advanced PID X X X X PIDController_AdvCalculate_FF_Sp_Pv_Per.vi Advanced PID X X X X PIDController_AdvExecute.vi Labview style helper. Advanced XX PIDController AtSetpoint.vi Χ XX PIDController Calculate PV.vi X PIDController_Calculate_SP_PV.vi XX X PIDController_DisableContinousInput.vi XX Χ XX PIDController_EnableContinousInput.vi Χ X X X X PIDController_Execute.vi Labview style helper PIDController_GetContinuousError.vi OBSOLETE - Removed

PIDController GetPeriod.vi

 $X \mid X \mid X \mid$

s Sun n	าเรรเทอ	one	VI)) Add	ed additional columns for test and sample.	
X	X		X		PIDController_GetPID.vi	
X	X		X		PIDController_GetPositionError.vi	
X	X		X		PIDController_GetSetpoint.vi	
X	X		X		PIDController_GetVelocityError.vi	
X			X		PIDController_IsContinuousEnabled.vi	
X	X		Χ		PIDController_New.vi	
X	Χ		X		PIDController_NewPeriod.vi	
X		Χ	X	SI	PIDController_Pack_AdvLimits.vi	
X		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	X	SI	PIDController_Pack_Tuning.vi	
X	X		X		PIDController_Reset.vi	
X	X		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
Х	Χ		Χ		PIDController_Setl.vi	
					PIDController_SetInputRange.vi	OBSOLETE – Removed
Χ	Χ		X		PIDController_SetIntegratorRange.vi	
X	Χ	X	X		PIDController_SetOutputLimits.vi	Advanced PID
X	Χ		X		PIDController_SetP.vi	
X	Χ	X	X		PIDController_SetPeriod.vi	
X	Χ		X		PIDController_SetPID.vi	
X	X	X	Χ		PIDController_SetPIDF.vi	Advanced PID
X	X		Χ		PIDController_SetSetpoint.vi	
X	X		Χ		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		\overline{X}	$\overline{}$	\overline{X}	_	1	T .	ProfiledPIDController AtGoal.vi	110100
T NOT IZED TID CONTROLLER	X	X		$\frac{1}{X}$				ProfiledPIDController AtSetpoint.vi	
	X	\overline{X}		X				ProfiledPIDController Calculate Meas.vi	
	X	X		X				ProfiledPIDController Calculate Meas Goal.vi	
	X	X		X				ProfiledPIDController Calculate Meas StateGoal.vi	
	X	X		X				ProfiledPIDController Calculate Meas StateGoal TrapCnsrt.vi	
	X	Χ		X				ProfiledPIDController DisableContInput.vi	
	X	Χ		X				ProfiledPIDController_EnableContInput.vi	
	X	Χ		X				ProfiledPIDController_GetGoal.vi	
	X	Χ		X				ProfiledPIDController_GetPeriod.vi	
	X	Χ	X	X				ProfiledPIDController_GetPID.vi	WPILIB has separate getters.
	X	Χ		X				ProfiledPIDController_GetPositionError.vi	
	X	Χ		X				ProfiledPIDController_GetSetpoint.vi	
	X	Χ		X				ProfiledPIDController_GetVelocityError.vi	
	X	X		X				ProfiledPIDController_New.vi	
	X	Χ		X				ProfiledPIDController_NewPeriod.vi	
	X	X		X	_		_	ProfiledPIDController_Reset.vi	
	X	Χ		X	-			ProfiledPIDController_Reset_PosOnly.vi	
	X	X		X	-			ProfiledPIDController_Reset_PosVel.vi	
	X	X		X	-			ProfiledPIDController_SetConstraints.vi	
	X	X		X	-			ProfiledPIDController_SetGoal.vi	
	X	X		X	+		-	ProfiledPIDController_SetGoal_PosOnly.vi	
	X	X		X	+		-	ProfiledPIDController_SetIntegratorRange.vi	
	X	X		X	+		-	ProfiledPIDController_SetPID.vi	
	X	X		X	+		-	ProfiledPIDController_SetTolerance_PosOnly.vi	
	X	Χ		X				ProfiledPIDController_SetTolerance_PosVel.vi	

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D.110577	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program		Function Prototype	Notes
RAMSETE	Χ	Χ		X	SI			Ramsete_New.vi	new	
	Χ	Χ		Χ	SI			Ramsete_New_B_Z.vi	new(b, zeta)	
	Χ	X		X	Χ			Ramsete_Calculate.vi	calculate	
	X	X		X	X			Ramsete_Calculate_Trajectory.vi	calculate_trajectory	
	Χ	Χ		X	SI			Ramsete_AtReference.vi	AtReference	
	Χ	Χ		X	SI			Ramsete_SetEnabled.vi	SetEnabled	
	Χ	Χ		Χ	SI			Ramsete_SetTolerance.vi	SetTolerance	
	X	X		X	X			Ramsete_SINC.vi	sinc	internal
	Χ	X	X	Χ	Χ			Ramsete_Diff_DO_Eng.vi		
	Χ	Χ	X	Χ	Χ			Ramsete_Diff_DO_SI.vi		

Documented	Not WPILIB	Menu Item	Execution Optimized Test Routine	Name	Function Prototype	Notes
Χ		X	SI	SimpleMotorFF_New.vi	public SimpleMotorFeedforward(double ks, double kv, double ka)	
					public SimpleMotorFeedforward(double ks, double kv)	
X		X	SI	SimpleMotorFF_Calculate.vi	public double calculate(double velocity, double acceleration)	
X		X	SI	SimpleMotorFF_CalculateVelocityOnly.vi	public double calculate(double velocity)	
	Х			SimpleMotorFF_Execute.vi		LabVIEW style single call
	X			SimpleMotorFF_ExecuteVelocityOnly.vi		LabVIEW style single call
X		X	X	SimpleMotorFF_MaxAchieveVel.vi	public double maxAchievableVelocity(double maxVoltage, double acceleration)	
X		X	X	SimpleMotorFF_MinAchieveVel.vi	public double minAchievableVelocity(double maxVoltage, double acceleration)	
X		X	X	SimpleMotorFF_MaxAchieveAccel.vi	public double maxAchievableAcceleration(double maxVoltage, double velocity)	
X		X	X	SimpleMotorFF_MinAchieveAccel.vi	public double minAchievableAcceleration(double maxVoltage, double velocity)	
	X X X	X X X X X X X X X X X X X X X X X X X	X	X	SimpleMotorFF_Calculate.vi SimpleMotorFF_Calculate.vi SimpleMotorFF_Calculate.vi SimpleMotorFF_CalculateVelocityOnly.vi SimpleMotorFF_Execute.vi SimpleMotorFF_Execute.vi SimpleMotorFF_ExecuteVelocityOnly.vi X X X X SimpleMotorFF_ExecuteVelocityOnly.vi X X X SimpleMotorFF_MaxAchieveVel.vi X X X SimpleMotorFF_MinAchieveVel.vi X X X SimpleMotorFF_MinAchieveVel.vi X X X SimpleMotorFF_MaxAchieveAccel.vi	Function Prototype public double calculate (double ks, double kv, double ka) Public double maxAchievable velocity, double maxVoltage, double acceleration) X X X SimpleMotorFF_MaxAchieveAccel.vi Public double minAchievableAcceleration(double maxVoltage, double velocity) X X X SimpleMotorFF_MinAchieveAccel.vi Public double maxAchievableAcceleration(double maxVoltage, double velocity) Y X X SimpleMotorFF_MinAchieveAccel.vi Public double minAchievableAcceleration(double maxVoltage, double velocity)

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized Test Routine	Sample Program	VI Name		Notes
POSE								pose2d new()	can use cluster constant
	Χ	Χ		Χ	SI		Pose_New_TRRO.vi	pose2d new(translation2d, rotation2d)	
	Χ	Χ		Χ	SI		Pose_New.vi	pose2d new(double x, double y, rotation2d)	
	Χ	X		X	SI		Pose_Plus.vi	pose2d plus(transform2d other)	
	Χ	X		X	SI		Pose_Minus.vi	transform2d minus(pose2d other)	
	Χ	X		X	SI		Pose_getTranslation.vi	translation2d getTranslation()	can also use cluster unpack
	Χ	Χ		X	SI		Pose_getRotation.vi	rotation2d getRotation()	can also use cluster unpack
	Χ		Χ	Χ	SI		Pose_getXY.vi		
	Χ		Χ	Χ	SI		Pose_getXYAngle.vi		
	Χ	Χ		Χ	SI		Pose_TransformBy.vi	pose2d transformby(transform2d other)	
	Χ	Χ		Χ	SI		Pose_RelativeTo.vi	pose2d relativeto(pose2d other)	
	Χ	Χ		Χ	Χ		Pose_Exp.vi	pose2d exp(twist2d twist)	
	Χ	Χ		Χ	Χ		Pose_Log.vi	twist2d log(pose2d end)	

		X		X	SI		Pose_Equals.VI	boolean equals(other obj)	
ROTATION	X X Implemented	X X Documented	Not WPILIB	X X Menu Item	오 영 Execution Optimized	Sample Program	VI Name Rotation_CreateAngle.vi Rotation CreateXY.vi	Function Prototype rotation2d new() rotation2d new(double value) rotation2d new(double x, double y)	Notes can use cluster constant
	X	X		X	SI		Rotation_CreateAngleDegrees.vi	rotation2d fromDegrees(double degrees)	convert to radians then create
	X	Χ		Χ	SI		Rotation_Plus.vi	rotation2d plus(rotation2d other)	
	Χ	X			SI		Rotation_Minus.vi	rotation2d minus(rotation2d other)	
	X	Χ		Χ	SI		Rotation_UnaryMinus.vi	rotation2d unaryminus()	
	X	X		Χ	SI		Rotation_Times.vi	rotation2d times(double scalar)	
	X	X		X	SI	+-	Rotation_RotateBy.vi	rotation2d rotateby(rotation2d other)	1/00/04
	X	V	Χ	X	SI	+-	Rotation_GetAngleCosSin.vi	double not Dedicas ()	New 1/26/21
	X	X		X	SI SI	-	Rotation_GetRadians.VI	double getRadians() double getDegrees()	use cluster unpack use cluster unpack, then convert to
	^	^		^	31			double getDegrees()	degree
	X	Χ		X	SI		Rotation GetCos.VI	double getCos()	use cluster unpack
	X	Χ		Χ	SI		Rotation_GetSin.VI	double getSin()	use cluster unpack
	X	Χ		Χ	SI		Rotation_GetTan.VI	double getTan()	can calculate
	Χ	Χ		X	SI		Rotation_Equals.vi	boolean equals(rotation2d other)	
	entec	entec	IL IB	m _e	on Optimized utine	Prog			
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 Not WPILIB	X X X	S S S S S S S S S S	Sample Program	VI Name Transform_Create_PosePose.vi Transform_Create_TransRot.vi Transform_Times.vi Transform_GetTranslation.VI Transform_GetRotation.VI Transform_GetXY.vi Transform_GetXYAngle.vi Transform_Inverse.vi Transform_Equals.VI	Function Prototype transform2d new(pose2d, pose2d) transform2d new(translation2d, rotation2d) transform2d new() transform2d times(double scalar) translation2d getTranslation() rotation2d getRotation() transform inverse() boolean equals(other transform2d)	Notes can use cluster constant 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 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	Sample Program Sample I	Transform_Create_PosePose.vi Transform_Create_TransRot.vi Transform_Times.vi Transform_GetTranslation.VI Transform_GetRotation.VI Transform_GetXY.vi Transform_GetXYAngle.vi Transform_Inverse.vi Transform_Equals.VI VI Name Translation_Create_vi Translation_Create_DistAng.vi Translation_GetDistance.vi Translation_GetX.VI Translation_GetY.VI Translation_GetXY.VI Translation_GetXY.VI	transform2d new(pose2d, pose2d) transform2d new(translation2d, rotation2d) transform2d new() transform2d times(double scalar) translation2d getTranslation() rotation2d getRotation() transform inverse() boolean equals(other transform2d) Function Prototype translation2d new() translation2d new(double x, double y) double getDistance(translation2d other) double getX() double getY()	can use cluster constant use cluster unpack use cluster unpack new Notes can use cluster constant can use cluster unpack can use cluster unpack
	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		Transform Create PosePose.vi Transform Create TransRot.vi Transform Times.vi Transform GetTranslation.VI Transform GetRotation.VI Transform GetXY.vi Transform GetXYAngle.vi Transform Inverse.vi Transform Equals.VI VI Name Translation Create DistAng.vi Translation GetDistance.vi Translation GetX.VI Translation GetX.VII Translation GetNorm.VI	transform2d new(pose2d, pose2d) transform2d new(translation2d, rotation2d) transform2d new() transform2d times(double scalar) translation2d getTranslation() rotation2d getRotation() transform inverse() boolean equals(other transform2d) Function Prototype translation2d new() translation2d new(double x, double y) double getDistance(translation2d other) double getX() double getY()	can use cluster constant use cluster unpack use cluster unpack new Notes can use cluster constant can use cluster unpack
		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		Transform Create PosePose.vi Transform Create TransRot.vi Transform Times.vi Transform GetTranslation.VI Transform GetRotation.VI Transform GetXY.vi Transform GetXYAngle.vi Transform Inverse.vi Transform Equals.VI VI Name Translation Create DistAng.vi Translation GetDistance.vi Translation GetX.VI Translation GetNorm.VI Translation GetNorm.VI Translation RotateBy.vi	transform2d new(pose2d, pose2d) transform2d new(translation2d, rotation2d) transform2d new() transform2d times(double scalar) translation2d getTranslation() rotation2d getRotation() transform inverse() boolean equals(other transform2d) Function Prototype translation2d new() translation2d new(double x, double y) double getDistance(translation2d other) double getX() double getY() double getNorm() translation2d rotateBy(rotation2d other)	can use cluster constant use cluster unpack use cluster unpack new Notes can use cluster constant can use cluster unpack can use cluster unpack
	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		Transform Create PosePose.vi Transform Create TransRot.vi Transform Times.vi Transform GetTranslation.VI Transform GetRotation.VI Transform GetXY.vi Transform GetXYAngle.vi Transform Inverse.vi Transform Equals.VI VI Name Translation Create DistAng.vi Translation GetDistance.vi Translation GetX.VI Translation GetX.VII Translation GetNorm.VI	transform2d new(pose2d, pose2d) transform2d new(translation2d, rotation2d) transform2d new() transform2d times(double scalar) translation2d getTranslation() rotation2d getRotation() transform inverse() boolean equals(other transform2d) Function Prototype translation2d new() translation2d new(double x, double y) double getDistance(translation2d other) double getX() double getY()	can use cluster constant use cluster unpack use cluster unpack new Notes can use cluster constant can use cluster unpack can use cluster unpack

FRC LabVIEW Trajectory Library – VI Implementation	List	<u>t</u>		,,					
Revision 2.X 11/12/2021 – State Space Items – (This list is s		issing X	one \	/I) X	Adde:	d addıtı	onal columns for test and sample. Translation_UnaryMinus.vi	translation2d unaryminus()	
	X	X	$\overline{}$	\hat{X}			Translation Times.vi	translation2d driaryminds() translation2d times(double scalar)	
	,			,	O.		- Tariousiani Timosini	translation2d div(double scalar)	can multiply by 1/scalar
	Χ	Χ		Χ	SI		Translation_Equals.vi	boolean equals(translation other)	1 3 3
	pə	þe	en.		Optimized	ne oaram			
TWIST	< Implemented	X Documented	Not WPILIE	X Menu Item	© Execution	Test Routine Sample Program	VI Name Twist Create.vi	Function Prototype twist new(x, y, theta)	Notes
TWIST	X	X	$\overline{}$		SI		Twist_Equals.VI	boolean equals(obj other)	
			X		SI		Twist GetAll.VI	booloan oqualo(obj othor)	
	71				<u> </u>		TWIST_000 W. VI		
E======= KINEMATICS E========					þe				
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimizec	Test Routine Sample Program	vi Name	Function Prototype	Notes
CHASSIS SPEEDS								chassisspeeds new ()	can use cluster constant
	Χ	Χ		Χ	SI		ChassisSpeeds_New.vi	chassisspeeds new (double xvel, double yvel, double angvel)	
	Χ	X		Χ	SI		ChassisSpeeds_FromFieldRelativeSpeeds.VI	chassisspeeds fromFieldRelativeSpeeds(double x, double y,	
		Ш						double angvel, rotation2d robotangle)	
DIFFERENTIAL DRIVE KINEMATICS	(Implemented	Documented	Not WPILIB	X Menu Item	- Execution Optimized	Test Routine Sample Program		Function Prototype	Notes
DIFFERENTIAL DRIVE KINEMATICS	χ 	$\frac{\lambda}{\lambda}$	\vdash	X	V		DiffKinematics_New.vi DiffKinematics_toChassisSpeed.vi	diffDriveKine new(double trackWidth) chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds)	
	Х	X	$\overline{}$	X	SI		DiffKinematics_toWheelSpeed.vi	diffDriveWheelSpeed toWheelSpeeds(chassisSpeeds)	+
DIFFERENTIAL DRIVE ODOMETRY	Implemented	Documented	Not WPILIB	Menu Item	otimized	Test Routine Sample Program		Function Prototype diffDrOdom new(rotation gyro, pose initial)	Notes
DIFFERENTIAL DRIVE ODOMETRY								diffDrOdom new(rotation gyro)	
	X	X		X	X		DiffOdometry_Update.vi	void resetPosition(pose2d, rotation2d) pose2d getPoseMeters() pose2d update(rotation2d gyro, double leftdist, double right dist)	incorporated into "update"
	^	^		^			5 Submitted y_opulie.vi	possed apacito rotationed gyro, double folialist, double fight dist	, interporates enhanced reset
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine Sample Program	VI Name	Function Prototype	Notes

		- 1					diffD w\//b = a C = a = d = = a = v/\	
DIFFERENTIAL DRIVE WHEEL SPEEDS							diffDrWheelSpeeds new()	
_	X			Х	V	DiffWheel Normalize.vi	diffDrWheelSpeeds new(double leftVel, double rightVel) void normalize(double maxVel)	
L	Χ	<i>X</i>		Χ	X	Dilivvneei_Normalize.vi	void normalize(double maxvei)	
MECANUM DRIVE KINEMATICS	X X	X X X		X X Menu Item	X X / Execution Optimized Test Routine	VI Name MecaKinematics_New.vi MecaKinematics_SetInverseKinematics.vi MecaKinematics_ToChassisSpeeds.vi	Function Prototype	Notes
	X			Χ	X	MecaKinematics_ToWheelSpeeds.vi		
	X	Χ		Χ	X	MecaKinematics_ToWheelSpeedsZeroCenter.vi		
MECANUM DRIVE MOTOR VOLTAGE[Implemented		Not WPILIB	Menu Item	Execution Optii Test Routine	Sample Program	Function Prototype	Notes
noth	ing do	one						
	X X	X X X		X X Wenu Item	Execution Op Test Routine	VI Name MecaOdometry_New.vi MecaOdometry_NewDefaultPose.vi MecaOdometry_GetPose.vi MecaOdometry_Reset.VI MecaOdometry_Update.vi	Function Prototype	Notes
	Χ	X		X		MecaOdometry_UpdateWithTime.vi		
MECANUM DRIVE WHEEL SPEEDS∫	✓ Implemented	X Documented	Not WPILIB	X Menu Item	© Execution Optimized Test Routine	VI Name MecaWheel_New.Vi	Function Prototype	Notes
MECANOM DRIVE WHEEL SPEEDS		X		X	X	MecaWheel_Normalize.vi	public MecanumDriveWheelSpeeds(double frontLeftMetersPerSecond, double frontRightMetersPerSecond, double rearLeftMetersPerSecond, double rearRightMetersPerSecond) public void normalize(double	
	- 1			- `			attainableMaxSpeedMetersPerSecond)	
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized Test Routine	Sample Program Manuel		

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	ry Library – VI Implementatior - State Space Items – (This list is s				\/I \	۸ ما ما م ما	م ما ما : 1 :	and columns for took and comple		
EVISION 2.A 11/12/2021 -	SWERVE DRIVE KINEMATICS		iissiriç	one	V1)	Added	addill	onal columns for test and sample.	public SwerveDriveKinematics(Translation2d wheelsMeters)	variable parameters (replace with
									,	array and "4" calls)
			X	X	X			SwerveKinematics_NewX.VI		uses array as input
		Χ		X	X			SwerveKinematics_New4.VI		For 4 module drives
		X	X		X			SwerveKinematics_ToSwerveModuleStates.VI	public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds, Translation2d centerOfRotationMeters)	
		X	Х		X			SwerveKinematics_ToSwerveModuleStatesZeroCenter.VI	public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds)	
									public ChassisSpeeds toChassisSpeeds(SwerveModuleState wheelStates)	variable parameters (replace with array and "4" calls)
		X	X	X	Χ			SwerveKinematics ToChassisSpeedsX.VI	wheelotates)	uses array as input
		X	X	X	X			SwerveKinematics ToChassisSpeeds4.VI		For 4 module drives
		X						SwerveKinematics_NormalizeWheelSpeeds.vi	public static void normalizeWheelSpeeds(SwerveModuleState[] moduleStates, double attainableMaxSpeedMetersPerSecond)	Tot 4 modulo drives
		pə,	pə	В		Execution Optimized	Program		•	
		nplemente	Documentec	Not WPILIB	Menu Item	Execution Op	Sample Pr	VI Name	Function Prototype	Notes
	SWERVE DRIVE ODOMETRY	_=_		_ <	<u>≥</u> X	Ч	<u>, ν</u>	SwerveOdometry_New.VI	public SwerveDriveOdometry(SwerveDriveKinematics kinematics,	
		X			X			SwerveOdometry_NewZeroCenter.VI	Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics,	
		X	X		X			SwerveOdometry_ResetPosition.VI	Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)	
		X			X			SwerveOdometry GetPosition.VI	public Pose2d getPoseMeters()	
		^	^		^			Swerve Odometry_Getrosition.vi	public Pose2d getPoseMeters() public Pose2d updateWithTime(double currentTimeSeconds,	variable parameters (replace with
									Rotation2d gyroAngle, SwerveModuleState moduleStates)	array and "4" calls)
		X	Х	X	Х			SwerveOdometry_UpdateWithTimeX.VI	Trotationza gyror trigio, oworvomodulootato modulootatooj	uses array as input
		X	X	X	X			SwerveOdometry UpdateWithTime4.VI		For 4 module drives
									public Pose2d update(Rotation2d gyroAngle,	variable parameters (replace with
									SwerveModuleState moduleStates)	array and "4" calls)
		X	X	X	X			SwerveOdometry_UpdateX.VI		uses array as input
		X	X	X	X			SwerveOdometry_Update4.VI		For 4 module drives
S:	WERVE DRIVE MODULE STATE	X X Implemented	X	Not WPILIB	X X Menu Item	9 9 Execution Optimized	Sample Program	VI Name SwerveModuleState_New.vi SwerveModuleState_CompareTo.vi SwerveModuleState_Optimize.vi	Function Prototype public SwerveModuleState(double speedMetersPerSecond, Rotation2d angle) public int compareTo(SwerveModuleState o) public SwerveModuleState optimize(SwerveModuleState desired Rotation2d angle)	Notes ,
======= NE =======						70				
		mplemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Sample Program	VI Name	Function Prototype	Notes
	CUBIC HERMITE SPLINE	_=_		_<	X X	<u> </u>	. v	CubicHermiteSpline_New.vi	public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[]	
				1			_		yFinalControlVector)	not no adad trac strategram.
				1					protected SimpleMatrix getCoefficients()	not needed, use cluster unpack
		X	X		X			CubicHermiteSpline_makeHermiteBasis.vi	private SimpleMatrix makeHermiteBasis()	

Revision 2.X 11/12/2021 – State Space Items – (This list is still missing one VI....) Added additional columns for test and sample. CubicHermiteSpline getControlVectorFromArrays.vi private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) Execution Optimized Test Routine Vot WPILIB Menu Item VI Name Function Prototype Notes POSE WITH CURVATURE X public PoseWithCurvature(Pose2d poseMeters, double PoseWithCurve New.vi curvatureRadPerMeter) public PoseWithCurvature() can use cluster constant public Pose2d poseMeters not needed, use cluster unpack public double curvatureRadPerMeter. not needed, use cluster unpack Execution Optimized nple Progi Not WPILIB Menu Item VI Name **Function Prototype** Notes QUINTIC HERMITE SPLINE X X QuinticHermiteSpline New.vi public QuinticHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector) protected SimpleMatrix getCoefficients() not needed, use cluster unpack X Χ QuinticHermiteSpline makeHermiteBasis.vi private SimpleMatrix makeHermiteBasis() private SimpleMatrix getControlVectorFromArrays(double[] Χ Χ QuinticHermiteSpline getControlVectorFromArrays.vi initialVector, double[] finalVector) cution Optimized Program Function Prototype VI Name Notes **SPLINE (Abstract class)** Spline(int degree) Spline getPoint.vi public PoseWithCurvature getPoint(double t) $X \mid X \mid$ | X | public static class ControlVector public ControlVector(double[] x, double[] y) implemented as data structure Sample Program Execution Optin **Test Routine** Not WPILIB **Menu Item** VI Name Function Prototype Notes public static Spline.ControlVector[] SPLINE HELPER X SplineHelp GetCubicCtrlVectorsFromWayPts.vi X getCubicControlVectorsFromWaypoints(Pose2d start, Translation2d[] interiorWaypoints, Pose2d end) Χ $X \mid X$ SplineHelp GetCubicCtrlVectorsFromWeightedWayPts.vi SplineHelp GetQuinticCtrlVectorsFromWayPts.vi public static List<Spline.ControlVector> $X \mid X$ X getQuinticControlVectorsFromWaypoints(List<Pose2d> waypoints) SplineHelp GetQuinticCtrlVectorsFromWeightedWayPts.vi XX XX SplineHelp getCubicSplinesFromControlVectors.vi Χ public static CubicHermiteSpline[] getCubicSplinesFromControlVectors(Spline.ControlVector start, Translation2d[] waypoints, Spline.ControlVector end) X X X No SplineHelp GetCubicSpline Calc1.vi internal SplineHelp_GetCubicSpline Calc2.vi X X X No internal X X X No SplineHelp GetCubicSpline Calc3.vi internal

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FRC LabVIEW Trajectory Library – VI Implementation Revision 2.X 11/12/2021 – State Space Items – (This list is s	List	eeina	one V	<u> </u>	Added a	addition	al columns for test and sample		
Tevision 2.X 11/12/2021 State Space Rems (This list is s	X	X		X	tuucu e		SplineHelp_getQuinticSplinesFromControlVectors.vi	public static QuinticHermiteSpline[] getQuinticSplinesFromControlVectors(Spline.ControlVector[]	
	X	X		Vo			SplineHelp_ThomasAlgorithm.vi	controlVectors) private static void thomasAlgorithm(double[] a, double[] b, double[] c, double[] d, double[] solutionVector)	internal
	Χ	X		X	SI		SplineHelp_GetCubicCtrlVector.vi	private static Spline.ControlVector getCubicControlVector(double scalar, Pose2d point)	
	Χ	X		X	SI		SplineHelp_GetQuinticCtrlVector.vi	private static Spline.ControlVector getQuinticControlVector(double scalar, Pose2d point)	
	Implemented	Documented		Menu Item	Execution Optimized Test Routine		VI Name		Notes
SPLINE PARAMETERIZER	X	X		X			SplineParam_Spline.vi	public static List <posewithcurvature> parameterize(Spline spline)</posewithcurvature>	
	Χ	X		X			SplineParam_Spline_T0_T1.vi	public static List <posewithcurvature> parameterize(Spline spline, double t0, double t1)</posewithcurvature>	
	Χ	X	X	Vo			SplineParam_StackGet.vi		internal
	X	X	X X	vo Vo			SplineParam_StackPop.vi SplineParam StackPush.vi		internal
'======= TRAJECTORY '========					nized	4			
TRAJECTORY	X X Implemented	X Documented		X Menu Iten	S S Execution Optimi Test Routine		VI Name Trajectory_New.vi Trajectory_New_Empty.vi	public Trajectory(final List <state> states)</state>	Notes can use cluster unpack, array index
								·	
								public double getTotalTimeSeconds() public List <state> getStates()</state>	not needed, use unpack not needed, use unpack
	Χ	X		X			Trajectory_Sample.vi	public State sample(double timeSeconds)	
	Χ	X	X	X			Trajectory_SampleReverse.vi		Sample in reverse order. Negate sample.
	Χ			Χ			Trajectory_TransformBy.vi	public Trajectory transformBy(Transform2d transform)	55.11.21.51
	X	Χ		X X			Trajectory_RelativeTo.vi	public Trajectory relativeTo(Pose2d pose) boolean equals(other obj)	FUTURE
	X	Х		Vo	SI		Trajectory_lerp_double.vi	private static double lerp(double startValue, double endValue, double t)	internal
	Χ	X		Vo	SI		Trajectory_lerp_Pose.vi	private static Pose2d lerp(Pose2d startValue, Pose2d endValue, double t)	internal
	Implemented	Documented	t WPILIB		Execution Optimized Test Routine	Sample Program			
TOA ICOTODY OTATE		DC	Not	ž	A E	Sa	VI Name		Notes
TRAJECTORY_STATE	Χ	Х			SI		TrajectoryState_New.vi	public State() public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter)	
	X	Х		X X			TrajectoryState_Interpolate.vi	State interpolate(State endValue, double i)	FUTURE
	Χ			∧				boolean equals(other obj)	FUTURE

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	Implemented	Documented	PILIB	ltem	Execution Optimized	Test Routine	Nample Program		
	Impler	Docun	Not WPILIB	Menu Item	Execu	Test R	ତ୍ର VI Name		Notes
TRAJECTORY CONFIG	X	X		X	SI		TrajectoryConfig_Create.vi	public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq)	
								<pre>public TrajectoryConfig addConstraint(TrajectoryConstraint constraint)</pre>	Implemented differently, can't duplicate.
								public TrajectoryConfig addConstraints(List extends TrajectoryConstraint constraints)	Implemented differently, can't duplicate.
	X	X		X	SI		TrajectoryConfig_setKinematicsDiffDrive.vi	public TrajectoryConfig setKinematics(DifferentialDriveKinematics kinematics)	
	X	X		Χ	SI		TrajectoryConfig_setKinematicsMecanumfDrive.vi	public TrajectoryConfig setKinematics(MecanumDriveKinematics kinematics)	
	X	X		X	SI		TrajectoryConfig_setKinematicsSwerveDrive.vi	public TrajectoryConfig setKinematics(SwerveDriveKinematics kinematics)	
								public double getStartVelocity()	can use cluster unpack
								public TrajectoryConfig setStartVelocity(double startVelocityMetersPerSecond)	
								public double getEndVelocity()	can use cluster unpack
								public TrajectoryConfig setEndVelocity(double endVelocityMetersPerSecond)	
								public double getMaxVelocity()	can use cluster unpack
									can use cluster unpack
								public List <trajectoryconstraint> getConstraints()</trajectoryconstraint>	Implemented differently, can't
								public boolean isReversed()	duplicate. can use cluster unpack
	X	X		X	SI		TrajectoryConfig_setReversed.vi	public boolean is reversed() public TrajectoryConfig setReversed(boolean reversed)	can use cluster unpack
	X	X	X		SI		TrajectoryConfig_setCentripetalAccel.vi	pasio majostory coming controversed (section in reversed)	
			X				TrajectoryConfig setVoltageDiffDrive.vi		
						'	, , , <u>, , , , , , , , , , , , , , , , </u>	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 emen In		Notes
TRAJECTORY GENERATE		X		X			TrajectoryGenerate_Make_Cubic_CtrlVect.vi	public static Trajectory generateTrajectory(Spline.ControlVector initial, List <translation2d> interiorWaypoints, Spline.ControlVector end, TrajectoryConfig config)</translation2d>	
	X	X		X			TrajectoryGenerate_Make_Cubic.vi	public static Trajectory generateTrajectory(Pose2d start, List <translation2d> interiorWaypoints, Pose2d end, TrajectoryConfig config)</translation2d>	uses cubic splines
	X	X		X			TrajectoryGenerate_Make_Quintic_CtrlVect.vi	public static Trajectory generateTrajectory(ControlVectorList controlVectors, TrajectoryConfig config)	uses quintic splines
	X	X		Х			TrajectoryGenerate_Make_Quintic.vi	public static Trajectory generateTrajectory(List <pose2d> waypoints, TrajectoryConfig config)</pose2d>	uses quintic splines
	X	X		Х			TrajectoryGenerate_splinePointsFromSplines.vi	public static List <posewithcurvature> splinePointsFromSplines(Spline[] splines)</posewithcurvature>	
TRAJECTORY GENERATE (Control Vector)	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program Name		Notes may not need, just data
INAJECTORT GENERATE (CONTROL VECTOR)								public control vector i isquit initial capacity)	may not need, just data

TRAJECTORY PARAMETERIZE TRAJECTORY PARAMETERIZE TRAJECTORY PARAMETERIZE TRAJECTORY PARAMETERIZE TRAJECTORY PARAMETERIZE TrajectoryParam_enforceAccel.vi TrajectoryParam_enforceAccel.vi TrajectoryParam_enforceAccel.vi TrajectoryParam_calcStuffFwd vi X X No I TrajectoryParam_calcStuffFwd vi X X X No I TrajectoryParam_calcStuffFwd vi X X X No I TrajectoryParam_calcStuffFwd vi X X X No I TrajectoryParam_calcStuffFwd vi	vision 2.X 11/12/2021 – State Space Items – (This list is	still m	nissin	g one	VI)	Added a	additi	onal columns for test and sample.		
TRAJECTORY PARAMETERIZE TRAJECTORY PARAMETERIZE TRAJECTORY PARAMETERIZE TRAJECTORY PARAMETERIZE TRAJECTORY PARAMETERIZE Trajectory Parameterize Security Parameterize Parameterize Parameterize Parameterize Parameterize Parameterize Parameterize Parameterize Pa									public ControlVectorList()	may not need, just data
TRAJECTORY PARAMETERIZE CONSTRAINED STATE TRAJECTORY PARAMETERIZE C									public ControlVectorList(Collection extends<br Spline.ControlVector> collection)	may not need, just data
TRAJECTORY PARAMETERIZE X X X X X N No		Implemented	Documented	Not WPILIB	Menu Item		Sample Program	VI Name	Function Prototype	Notes
TRAJECTORY PARAMETERIZE CONSTRAINED STATE X X X X X X X X X X X X X X X X X X X	TRAJECTORY PARAMETERIZE	i X	X						timeParameterizeTrajectory(List <posewithcurvature> points. List<trajectoryconstraint> constraints, double startVelocityMetersPerSecond, double endVelocityMetersPerSecond, double</trajectoryconstraint></posewithcurvature>	
TRAJECTORY UNITED TRAJECTORY U									private static void enforceAccelerationLimits(boolean reverse, List <trajectoryconstraint> constraints, ConstrainedState state)</trajectoryconstraint>	This routines needs to be changed when new constraints are added.
TRAJECTORY PARAMETERIZE CONSTRAINED STATE TRAJECTORY PARAMETERIZE C										
TRAJECTORY PARAMETERIZE CONSTRAINED STATE X X X X X X X Constrained State New vi Constrained S			X	X						This routines needs to be changed
TRAJECTORY UTIL TRAJEC	TRAJECTORY PARAMETERIZE CONSTRAINED STATE	_			X Menu Ite	Executic Test Rou	Sample	VI Name	ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double maxAccelerationMetersPerSecondSq)	Notes
TRAJECTORY UTIL X X X X X X X X X X		V	V	V	V			Canatrainad Stata, SatMay Appal vi	ConstrainedState()	
TRAJECTORY UTIL X X X X X X X X X										
TRAJECTORY UTIL Payment Payment		X	X	X	X			ConstrainedState_SetVelAccel.vi		
TRAJECTORY UTIL V		×	X	X	X			ConstrainedState_SetVelocity.vi		
public static String serializeTrajectory(Trajectory trajectory) Post	TRAJECTORY UTIL	L X	X		X	Execution Optimized Test Routine	Sample Program	VI Name TrajectoryUtil_fromPathWeaverJSON.vi	public static Trajectory fromPathweaverJson(Path path) public static void toPathweaverJson(Trajectory trajectory, Path path)	Notes
TRAPEZOID PROFILE X X X X X TrapProfConstraint_New.vi										
TRAPEZOID PROFILE X X X X TrapProfConstraint_New.vi		mplemented	Jocumented	Vot WPILIB	Menu Item	Execution Optimized Fest Routine	Sample Program	VI Name	Function Prototype	Notes
	TRAPEZOID PROFILE	$\exists \widehat{X}$	X		X	<u> </u>		TrapProfConstraint_New.vi		

Revision 2.X	11/12/2021 - State	Space Items –	(This list is still missing	one VI	 Added additiona 	I columns for test and same	ple.

			 altional columno for toot and cample.	
X	X	No	TrapProfile_Direct.vi	Private, remove from menu
X	X	XX	TrapProfile_Execute.vi	
X	X	X	TrapProfile_IsFinished.vi	
X	X	X	TrapProfile_New.vi	
X	X	X	TrapProfile_New_DefInitial.vi	
X	X	No	TrapProfile_ShouldFlipAcceleration.vi	Private, remove from menu
X	X	X	TrapProfile_TimeLeftUntil.vi	
X	X	X	TrapProfile_TotalTime.vi	
X	X	X	TrapProfState_Equals.vi	_
X	X	X	TrapProfState_New.vi	

'===== TRAJEC '=====

	X	Χ		Χ				FrapProfile_TotalTime.vi		
	X	Χ		Χ				ГrapProfState_Equals.vi		
	X	Χ		X				FrapProfState_New.vi		
======										
ECTORY CONSTRAINT										
======										
					eq					
					Execution Optimizea		3			
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	tec	je je	В	7	0	ije	Progi			
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	ы	Ę	ξ	n n	ü	ğ.	Sample			
	ďι	OC	ot	en	ě	est.	au,	# A L	F	N
			_ ≥		Ü	<u> </u>		/I Name		Notes
CENTRIPETAL ACCELERATION CONSTRAINT	X	X		X			(CentripetalAccelConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d	
									poseMeters, double curvatureRadPerMeter, double	
	X	X		X				CentripetalAccelConstraint_getMinMaxAccel.vi	velocityMetersPerSecond) public MinMax	
	_ ^	^		^			ľ	SentinpetalAccelConstraint_getiviiniviaxAccel.vi	getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters,	
									double curvatureRadPerMeter, double velocityMetersPerSecond)	
									double our value extractor, double velocity inclorar croccoria;	
	X	Χ		X	SI		(CentripetalAccelConstraint_New.vi	public CentripetalAccelerationConstraint(double	Can use cluster pack for now
								<u> </u>	maxCentripetalAccelerationMetersPerSecondSq)	·
									•	
					eq					
					ηż		4			
	_	_			zii.		ā			
	Ę	eq	В	~	Õ	ne	Program			
	en	ent	Ĭ	en	on	orti	ď			
	E .	Ĕ	ξ	711	Œ	8 .	a/e			
	Implementea	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample			
			_ž		<u> </u>	<u>" "</u>		/I Name		Notes
DIFF DRIVE KINEMATIC CONSTRAINT	X	X		X			ļ.	DiffDriveKinematicsConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d	
									poseMeters, double curvatureRadPerMeter, double	
									velocityMetersPerSecond)	
	X	X		X			ا	DiffDriveKinematicsConstraint_getMinMaxAccel.vi	public MinMax	
									getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters,	
									double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X	SI			DiffDriveKinematicsConstraint New.vi	public DifferentialDriveKinematicsConstraint(final	
	^			^	٥,		ľ	SINDING (INCINCING GOOD GUINE_IVEW.VI	DifferentialDriveKinematics kinematics, double	
									maxSpeedMetersPerSecond)	
						-			,,,,	
					99					
					timized		u			
					ţi		ram			
	Implemented	ьe	ω		Ö	96	Progr			
	ent	Documented	Not WPILIB	Menu Item		Test Routine	Ţ			
	Ĭ.	<i>u</i> e	Š	/ Ite	Execution	& .	Sample			
	ble	Ω	7	ne	ec	st	Ĭ,			
	<u>u</u>	Ğ	8	Ž	Щ	7e	Sa,	/I Name		Notes
DIFF DRIVE VOLTAGE CONSTRAINT	X	X		X			T	DiffDriveVoltageConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d	
									poseMeters, double curvatureRadPerMeter, double	
	L,-			,,				2.00	velocityMetersPerSecond)	
	X	X		X			ļ	DiffDriveVoltageConstraint_getMinMaxAccel.vi		Code updated to match 2/2020
									getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters,	library update.
									double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X	SI		 	DiffDriveVoltageConstraint_New.vi	public	Can use cluster pack for now
	^`	^``		-,	٥.		ľ		DifferentialDriveVoltageConstraint(SimpleMotorFeedforward	
									feedforward, DifferentialDriveKinematics kinematics, double	
									maxVoltage)	
										

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JERK CONSTRAINT	/ / Implemented	Documented	X X Not WPILIB	Menu Item	Secution Optimized	Test Routine	VI Name JerkConstraint_getMaxVelocity.vi JerkConstraint_getMinMaxAccel.vi JerkConstraint_New.vi	Function Prototype Routine exists, it is just a shell Routine exists, it is just a shell Routine exists, it is just a shell	Notes FUTURE FUTURE FUTURE FUTURE
MECANUM DRIVE KINEMATICS CONSTRAINT	X Implemented		Not WPILIB	X Menu Item	9 Execution Optimized	Test Routine	VI Name MecaDriveKinematicsConstraint_New.vi MecaDriveKinematicsConstraint_getMaxVelocity.vi	Function Prototype	Notes
	X			X			MecaDriveKinematicsConstraint_getMinMaxAccel.vi		
SWERVE DRIVE KINEMATICS CONSTRAINT	X Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine	VI Name SwerveDriveKinematicsConstraint_getMaxVelocity.vi	Function Prototype public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	Notes
	X	X		X			SwerveDriveKinematicsConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X	SI		SwerveDriveKinematicsConstraint_New.vi	Newpublic SwerveDriveKinematicsConstraint(final SwerveDriveKinematics kinematics, double maxSpeedMetersPerSecond)	Can use cluster pack for now
TDA IEGTODY GONGTDAINT									

TRAJECTORY CONSTRAINT

Interface class - nothing done (not needed)

TRAJECTORY CONSTRAINT (Min Max)

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	
X	Χ		X	SI			Constraint_MinMax_New.vi	Constraint_MinMax_New		
Χ	X		X	SI			Constraint_MinMax_NewMinMax.VI	Constraint_MinMax_New		
								·	<u>.</u>	

'======== UTILITY

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

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

'======== CONVERSIONS '=========

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimizec	st Routine	NI Name	Function Prototype	Notes
CONV	X	Χ	X	X	SI		Conv_AngleDegrees_Heading.vi		
	X	X	Χ	X	SI		Conv_AngleRadians_Heading.vi		
	X	X	Χ	X	SI		Conv_Centimeters_Meters.vi		
	X	X	Χ	X	SI		Conv_Deg_Radians.vi		
	X	Χ	Χ	X	SI		Conv_Feet_Meters.vi		
	X	Χ	X	X	SI		Conv_GyroDegrees_Heading.vi		
	X	Χ	X	X	SI		Conv_Heading_AngleRadians.vi		
	X	X	X	X	SI		Conv_Inches_Meters.vi		
	X		Χ	X			Conv_Kilograms_Pounds.vi		
	X	Χ	X	X	SI		Conv_Meters_Feet.vi		
	X	Χ	X	X	SI		Conv_Meters_Inches.vi		
	X	Χ	X	X	SI		Conv_POSE_SI_Eng.vi		
	X		Χ	X			Conv_Pounds_Kilograms.vi		
	X	X	X	X	SI		Conv_Radians_Deg.vi		
	X	X	X	X	SI		Conv Yards Meters.vi		

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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	ımple Program	VI Name	Function Prototype	Notes
UNITS	Χ	X		X				Units_DegreesToRadians.vi		
	X	X		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	X		X				Units_RadiansToDegrees.vi		
	Χ	X		X				Units_RotationsPerMinuteToRadiansPerSecond.vi		

'=========

PATHFINDER UTIL

'=========

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

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

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STATE SPACE MODEL

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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	ໜຶ່ ໄດ້ Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DC MOTOR	Χ	X		Χ		DCMotor_GetAndymark9015.vi					
	Χ	X		Χ		DCMotor_GetAndymarkRs775_125.vi					
	Χ	Χ		Χ		DCMotor_GetBag.vi					
	Χ	X		Χ		DCMotor_GetBanebotsRs550.vi					
	Χ	X		Χ		DCMotor_GetBanebotsRs775.vi					
	Χ	X		Χ		DCMotor_GetCIM.vi					
	Χ	X		Χ		DCMotor_GetCurrent.vi					
	Χ	Χ		Χ		DCMotor_GetFalcon500.vi					
	Χ	Χ		Χ		DCMotor_GetMiniCIM.vi					
	Χ	Χ		Χ		DCMotor_GetNEO.vi					
	Χ	Χ		Χ		DCMotor_GetNEO550.vi					
	Χ	Χ		Χ		DCMotor_GetVex775Pro.vi					
	Χ	Χ				DCMotor_GetRomiBuiltIn.vi					
	Χ	Χ		Χ		DCMotor_New.vi					
										ļ	

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Revision 2.X 11/12/2021 - State Space Items - (This list is still	I miss	sing o	ne VI) Add	ded ad	ditior	al columns for test and sample.						
	mplemented	Jocumented	Vot WPILIB Venu Item	Execution Optimized	Fest Routine	ımple Program	VI Name		Function Prototype	Notes	Sode Review	Fest Program	Error Checking
LINEAR SYSTEM ID	\overline{x}	\overline{X}	$\overline{}$				LinearSystemId_CreateDriveTrai	nVelocitySystem.vi		Update to use create matrix			
	X	X	X	,			LinearSystemId_CreateElevatorS			Update to use create matrix			
	X	X	X	·			LinearSystemId_CreateFlywheel			Update to use create matrix			
	Χ	Χ	X				LinearSystemId_CreateSingleJoi	ntedArmSystem.vi		Update to use create matrix			
	X		X	·			LinearSystemId_IdentifyDriveTra	inSystem.vi		Update to use create matrix			
)	X		X				LinearSystemId_IdentifyPositionS			Update to use create matrix			
)	X		X	·			LinearSystemId_IdentifyVelocityS	System.vi		Update to use create matrix			

'=========

STATE SPACE

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CE ESTIMATION ===												
	Implemented	Documented Not MPII IB	Menu Item	Execution Optimized	Test Routine	Sample Program	√I Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE POSE ESTIMATO			X				DiffDrivePoseEst AddVisionMeasurement.vi	71	Just a shell, not functional!		l ,	
	/						DiffDrivePoseEst BiConsum VisionCorrect.vi		·			
	Х		X				DiffDrivePoseEst BiFunc F.vi					
	X		X				DiffDrivePoseEst_BiFunc_H.vi					
	X		X				DiffDrivePoseEst_FillStateVector.vi					
	X		X				DiffDrivePoseEst_GetEstimatedPosition.vi					
	X		X				DiffDrivePoseEst_New.vi					
	X		X				DiffDrivePoseEst_ResetPosition.vi					
	X		X				DiffDrivePoseEst_SetVisionMeasurementStdDevs.vi					
	X		X				DiffDrivePoseEst_Update.vi					
	X X		X	P			DiffDrivePoseEst_Update.vi DiffDrivePoseEst_UpdateWithTime.vi					
	Implemented X	Documented Not WPII IB	Menu Item	Execution Optimized	Test Routine	Sample Program	DiffDrivePoseEst_UpdateWithTime.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
EXTENDED KALMAN FILTE	X Implemented	Documented Not WPILIB	X Menu Item	Execution Optimized	Test Routine	Sample Program	DiffDrivePoseEst_UpdateWithTime.vi VI Name ExtendedKalmanFilter_Correct.vi	Function Prototype	Notes Just a shell, not functional!	Code Review	Test Program	
EXTENDED KALMAN FILTE	X X X X X X X X X X	Documented Not WPILIB	X Wenu Item	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_Correct_OnlyUY.vi	Function Prototype		Code Review	Test Program	
EXTENDED KALMAN FILTE	X X X X X	Documented Not WPII IB	X Wenu Item	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_GetP.vi	Function Prototype		Code Review	Test Program	
EXTENDED KALMAN FILTE	X X X X X X	Documented Not WPII IB	X X X X X	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_GetP.vi ExtendedKalmanFilter_GetP_Single.vi	Function Prototype		Code Review	Test Program	
EXTENDED KALMAN FILTE	X X X X X X X X X X X X X X X X X X X	Documented Not WPII IB	X X X X X X	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_GetP.vi ExtendedKalmanFilter_GetP_Single.vi ExtendedKalmanFilter_GetXHat.vi	Function Prototype		Code Review	Test Program	
EXTENDED KALMAN FILTE	X X X X X X X X X X X X X X X X X X X	Documented Not WPII IB	X X X X X X X	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_GetP.vi ExtendedKalmanFilter_GetP_Single.vi ExtendedKalmanFilter_GetXHat.vi ExtendedKalmanFilter_GetXHat_Single.vi	Function Prototype		Code Review	Test Program	
EXTENDED KALMAN FILTE	X X X X X X X X X X X X X X X X X X X	Documented Not WPII IB	X X X X X X X X X X X X X X X X X X X	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_GetP.vi ExtendedKalmanFilter_GetP_Single.vi ExtendedKalmanFilter_GetXHat.vi ExtendedKalmanFilter_GetXHat_Single.vi ExtendedKalmanFilter_New.vi	Function Prototype		Code Review	Test Program	
EXTENDED KALMAN FILTE	X X X X X X X X X X X X X X X X X X X	Documented Not WPII IB	X X X X X X X X	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_GetP.vi ExtendedKalmanFilter_GetP_Single.vi ExtendedKalmanFilter_GetXHat.vi ExtendedKalmanFilter_GetXHat.vi ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi	Function Prototype		Code Review	Test Program	
EXTENDED KALMAN FILTE	X X X X X X X X X X X X X X X X X X X	Documented Not WPII IB	X X X X X X X X X	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_GetP.vi ExtendedKalmanFilter_GetP_Single.vi ExtendedKalmanFilter_GetXHat.vi ExtendedKalmanFilter_GetXHat.vi ExtendedKalmanFilter_Pedict.vi ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Predict.vi	Function Prototype		Code Review	Test Program	
EXTENDED KALMAN FILTE	X X X X X X X X X X X X X X X X X X X	Documented Not WPII IB	X X X X X X X X X X X X X X X X X X X	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_GetP.vi ExtendedKalmanFilter_GetP_Single.vi ExtendedKalmanFilter_GetXHat.vi ExtendedKalmanFilter_GetXHat.vi ExtendedKalmanFilter_Pedict.vi ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Reset.vi ExtendedKalmanFilter_Reset.vi	Function Prototype		Code Review	Test Program	
EXTENDED KALMAN FILTE	X X X X X X X X X X X X X X X X X X X	Documented Not Well IR	X X X X X X X X X	Execution Optimized	Test Routine	Sample Program	VI Name ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter_Correct_OnlyUY.vi ExtendedKalmanFilter_GetP.vi ExtendedKalmanFilter_GetP_Single.vi ExtendedKalmanFilter_GetXHat.vi ExtendedKalmanFilter_GetXHat.vi ExtendedKalmanFilter_Pedict.vi ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Predict.vi	Function Prototype		Code Review	Test Program	

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2.X 11/12/2021 – State Space Items – (This list is sti	II missin	ng one	VI	.) Adde	ed addition	onal columns for test and sample.	-				
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	<i>Implementec</i> Documentec	Not WPILIB	Menu Iten	Execution	Test Routine Sample Prog	VI Name	Function Prototype	Notes	Code Reviev	Test	Erro
KALMAN FILTER		_ <	_ <u>≺</u>		<u> </u>	KalmanFilter Correct.vi	T unction i fototype	Notes			Щ
	X		$\frac{1}{x}$			KalmanFilter New.vi					
	X		$\frac{\lambda}{X}$			KalmanFilter Predict.vi					
	X		$\frac{1}{X}$			KalmanFilter Reset.vi					
	X		X			KalmanFilter_GetK					
	X		$\frac{\hat{x}}{x}$			KalmanFilter_GetK_Single.vi					
	X		$\frac{1}{X}$			KalmanFilter SetXHat					
	X		$\frac{1}{X}$			KalmanFilter_SetXHat_Initial					
	X		$\frac{1}{x}$			KalmanFilter_GetXHat					
	X		$\frac{\lambda}{X}$			KalmanFilter_GetXHaT_Single					
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	<i>Implemented</i> Documented	Not WPILIB	Menu Iten	Execution	Test Routine Sample Prog	VI Name	Function Prototype	Notes	Code Revien	Test	Error
KALMAN FILTER LATENCY COMPENSATOR	/		┰╴		1- 0)	KalmanFilterLatencyComp_AddObserverState.vi	T undustri retetype	Work in progress.	$\overline{}$		
	/					KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.vi		Work in progress.			
	/					KalmanFilterLatencyComp_FindClosestMeasurement.vi		Work in progress.			
	/					KalmanFilterLatencyComp_New.vi		Work in progress.			
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	Implementec Documentec	Not WPILIE	Menu Item	Execution	Test Routine Sample Prog	VI Name	Function Prototype	Notes	Code Revien	Test Program	Error
UNSCENTED KALMAN FILTER			\overline{X}		. 0)	UnscentedKalmanFilter Correct.vi	,	Work in progress.		1 -	
	X		X			UnscentedKalmanFilter_Correct_FuncGroup.vi		, ,			
	X		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					
	X		X			UnscentedKalmanFilter_New_Default.vi					
	X		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		1			UnscentedKalmanFilter Transform.vi					
	^		X			Unscenteuralmanriller_transform.vi					
	Λ		X			Onscented Calman Filter_ Hanslorm.vi					

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

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LinearSystem_CalculateX.vi

LinearSystem CalculateY.vi

Function Prototype

Notes

LINEAR SYSTEM X

Χ

Χ

Χ

s still n	าเรรเทฐ	ı one VI)	Add	led ad		olumns for test and sample.	
X		X				arSystem_GetA.vi	
X		X			Linea	arSystem_GetAElement.vi	
X		X				arSystem_GetB.vi	
X		X				arSystem_GetBElement.vi	
X		X			Linea	arSystem_GetC.vi	
X		X				arSystem_GetCElement.vi	
X		X				arSystem_GetD.vi	
X		X				arSystem_GetDElement.vi	
X		X			Linea	arSystem_New.vi	

	Implemented	Documented Inc. 1971	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
LINEAR SYSTEM LOOP	Χ		X				LinearSystemLoop_ClampInput.vi					
	X		X				LinearSystemLoop_Correct.vi					
							LinearSystemLoop_GetClampFunction.vi					
	Χ		X				LinearSystemLoop_GetController.vi					
	Χ		X				LinearSystemLoop_GetError_Single.vi					
	Χ		X				LinearSystemLoop_GetError.vi					
	Χ		X				LinearSystemLoop_GetFeedForward.vi					
	Χ		X				LinearSystemLoop_GetNextR_Single.vi					
	Χ		X				LinearSystemLoop_GetNextR.vi					
	Χ		X				LinearSystemLoop_GetObserver.vi					
	Χ		X				LinearSystemLoop_GetU_Row.vi					
	Χ		X				LinearSystemLoop_GetU.vi					
	Χ		X				LinearSystemLoop_GetXHat_Single.vi					
	Χ		X				LinearSystemLoop_GetXHat.vi					
							LinearSystemLoop_New_BBB					
							LinearSystemLoop_New_LinearSystem_ClampFunc					
	Χ		X				LinearSystemLoop_New_LinearSystem_ClampVal.vi					
	Χ		X				LinearSystemLoop_New.vi					
	Χ		X				LinearSystemLoop_Predict.vi					
	Χ		X				LinearSystemLoop_Reset.vi					
							LinearSystemLoop_SetClampFunction.vi					
							LinearSystemLoop_SetNextR_Some.vi					
	Χ		X				LinearSystemLoop_SetNextR.vi					
							LinearSystemLoop_SetXHat_Single.vi					
							LinearSystemLoop_SetXHat.vi					
Į												

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

> X Not WPILIB
> X Menu Item Function Prototype Notes BiFuncHelp_MatrixMinus.vi
> BiFuncHelp_MatrixMult.vi
> BiFuncHelp_MatrixMult_CoerceSizeB.vi
> BiFuncHelp_MatrixPlus.vi Bi-FUNCTION HELP X XX X X XX XX

Revision 2.X 11/12/2021 - State Space Items - (This list is still missing one VI....) Added additional columns for test and sample. iple Program Function Prototype Notes DISCRETIZATION X Discretization DiscretizeA.vi X X Discretization DiscretizeAB.vi Χ Discretization DiscretizeABTaylor.vi Χ X Discretization DiscretizeAQTaylor.vi Χ Χ Discretization DiscretizeR.vi **Function Prototype** Notes STATE SPACE UTIL X StateSpaceUtil MakeCostMatrix.vi X StateSpaceUtil MakeCovarianceMatrix.vi Χ X StateSpaceUtil MakeWhiteNoiseVector.vi StateSpaceUtil IsStabalizable.vi Χ X StateSpaceUtil_PoseToVector.vi X X StateSpaceUtil_ClampInputMaxMagnitude.vi Routine exists, it is just a shell Χ X StateSpaceUtil NomalizeInputVector.vi Χ Χ StateSpaceUtil PoseTo4dVector.vi Χ Χ StateSpaceUtil PoseTo3dVector.vi '======== SIMULATION '======== Function Prototype Notes BATTERY SIM X BatterySim CalculateDefaultBatteryLoadedVoltage.vi Χ BatterySim CalculateLoadedVoltage.vi X Venu Item Function Prototype Notes DIFFERENTIAL DRIVE TRAIN SIM X DiffDriveTrainSim ClampInput.vi Χ DiffDriveTrainSim CreateKitbotSim.vi Χ DiffDriveTrainSim CreateKitbotSim EstMass.vi Χ DiffDriveTrainSim_CreateKitbotSim_EstMassMOI.vi Χ DiffDriveTrainSim GetCurrentDrawAmps.vi Χ DiffDriveTrainSim GetCurrentGearing.vi Χ DiffDriveTrainSim_GetDynamics.vi Χ DiffDriveTrainSim GetHeading.vi Χ DiffDriveTrainSim GetLeftCurrentDrawAmps.vi DiffDriveTrainSim GetLeftPositionMeters.vi

	X					DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi				<u> </u>	
	X					DiffDriveTrainSim_GetOutput_Single.vi					
	X					DiffDriveTrainSim_GetPose.vi					
	X					DiffDriveTrainSim_GetRightCurrentDrawAmps.vi					
	X					DiffDriveTrainSim_GetRightPositionMeters.vi				<u> </u>	
	X					DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi				<u> </u>	
	X					DiffDriveTrainSim_GetState.vi					
	X					DiffDriveTrainSim_GetState_Single.vi					
	X					DiffDriveTrainSim KitBotWheelSize.vi					
	X					DiffDriveTrainSim New.vi					
	X					DiffDriveTrainSim New Mass MOI.vi					
	X					DiffDriveTrainSim_SetCurrentGearing.vi					
	X					DiffDriveTrainSim_SetInputs.vi					
	X					DiffDriveTrainSim SetPose.vi					
	X					DiffDriveTrainSim SetState.vi			+		
	X					DiffDriveTrainSim_ToughBoxMiniGearRatio.vi			+		
	X					DiffDriveTrainSim_ToughBoxMiniMotor.vi			+		
	X					DiffDriveTrainSim_Update.vi			+		
	^					Dilibrive HainSini_Opdate.vi				 '	
	Implemented	Documented Not WPILIB	Menu Item	Execution Optimi. Test Routine	mple Program	VI Name			ode Review	Test Program	ror Checking
	Ė	8 8	ĕ	Ĭ,	Sa	VI Name	Function Prototype	Notes	ပိ	Ţe	Error
EVATOR SIN	M X		X			ElevatorSim New.vi					
	X		X			ElevatorSim GetCurrentDraw.vi					
	X		X			ElevatorSim GetPositionMeters.vi					
	X		X			ElevatorSim_GetVelocityMetersPerSecond.vi			+		
	X		$\frac{1}{X}$			ElevatorSim_SetInputVoltage.vi			+		
	X		$\frac{X}{X}$			ElevatorSim_UpdateX.vi			+		
	X		$\frac{x}{x}$			ElevatorSim_WouldHitLowerLimit.vi			+		
	X		$\frac{\lambda}{X}$			ElevatorSim_WouldHitUpperLimit.vi			+		
	X	X				ElevatorSim_Update.vi		Needed because this doesn't	+		
	^	^	^			Lievaloi Siiii_Opuale.vi		extend.		1	
	X		X			ElevatorSim HasHitLowerLimit.vi		exteria.	+		
	X		$\frac{X}{X}$			ElevatorSim HasHitUpperLimit.vi			+		
	X	Х				ElevatorSim_RKF45_Func.vi			+		
	^	^				ElevatorSim New NoNoise.vi			+		
						ElevatorSim_New_LinSys.vi			+		
						ElevatorSim New LinSys NoNoise.vi			+		
						Elevatorolini_New_Linoys_Nonoise.vi					
	Implemented	Documented Not WPILIB	Menu Item	Execution Optimized	ample Program	VI Name			Code Review	Test Program	Error Checking
		ž¤Ž		Ü F	, κ	VI Name	Function Prototype	Notes	<u>ŏ</u>		
YWHEEL SIN			X			FlyWheelSim_GetAngularVelocityRadPerSec.vi				<u> </u>	
	X		X			FlyWheelSim_New_MOI.vi				<u> </u>	
	X		X			FlyWheelSim_SetInput.vi				<u> </u>	
	X		X			FlyWheelSim_Update.vi				<u> </u>	
	X		X			FlyWheelSim_GetCurrentDrawAmps					
	X		X			FlyWheelSim_GetAngularVelocityRPM.vi					
						FlyWheelSim_New_LinSys_NoNoise		Future			
						FlyWheelSim_New_LinSys		Future		1	
						FlyWheelSim_New_LinSys_MOI_NoNoise		Future		1	

FRC LabVIEW Trajectory Library – VI Implementa	tion List	t									
Revision 2.X 11/12/2021 – State Space Items – (This list	is still mi	issing o	ne VI) Added	d add	ional columns for test and sample.	_				
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LINEAD OVOTEN		ٔ ک	ŠŽ		<u>~</u>	VI Name	Function Prototype	Notes	<u>`</u>	<u> </u>	En
LINEAR SYSTEM S	X X		X			LinearSystemSim_GetOutput.vi LinearSystemSim GetOutput Single.vi					
	X		X			LinearSystemSim_New					
	X		$\frac{\lambda}{X}$			LinearSystemSim SetInput Single.vi					
	X		X			LinearSystemSim_Update.vi					
	X		No			LinearSystemSim_UpdateX.vi					
	X		X No			LinearSystemSim_UpdateY.vi					
						LinearSystemSim_New_NoNoise.vi					
	X					LinearSystemSim_SetInput.vi					
	X		X			LinearSystemSim_SetInput_Array.vi		Doesn't use clamp ?			
	Χ		X			LinearSystemSim_Setstate.vi		DON'T IMPLEMENT			
	X					LinearSystemSim_GetCurrentDrawAmps.vi LinearSystemSim_ClampInput.vi		DONT IMPLEMENT			
	_ ^ _					Linear System Sim_Clampinput.vi					
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	Implemente	Documente	Not WPILIB Menu Item	Execution	Test Routine	VI Name	Function Prototype	Notes	Code	Test	Em
SINGLE JOINT ARM S			\overline{X}			SngJntArmSim_EsitmateMOI.vi	71		1		
	X		X			SngJntArmSim_GetAngleRads.vi					
	X		X			SngJntArmSim_GetCurrentDraw.vi					
	X		X			SngJntArmSim_GetVelocityRadsPerSec.vi					
	X		X			SngJntArmSim_HasHitLowerLimit.vi					
	X		X			SngJntArmSim_HasHitUpperLimit.vi					
	X		X			SngJntArmSim_New.vi SngJntArmSim_Rkf45_Func.vi					
	X		X			SngJntArmSim_SktInputVoltage.vi					
	X		$\frac{x}{X}$			SngJntArmSim_Update.vi					
	X		X			SngJntArmSim_UpdateX.vi					
	X		X			SngJntArmSim WouldHitLowerLimit.vi					
	X		X			SngJntArmSim_WouldHitLowerLimit.vi SngJntArmSim_WouldHitUpperLimit.vi					
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MATRIX UTILITIES											
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	nen	Jen	olL.	ion'	out				3e7	rog	Checking
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	Implemente	Docume	Not WPILIE Menu Item	Execution	Test Routine	VI Name	Function Prototype	Notes	Code Revie	Test Progr	Error
MAT BUILD	ER X	7	< < X			MatBuilder Fill.vi					F
MAT BUILD	X		X			MatBuilder Create.vi					
			,			_ ·		I	1		

FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 11/12/2021 – State Space Items – (This list is still missing one VI....) Added additional columns for test and sample. nple Program VI Name Function Prototype Notes MATRIX X Matrix_AssignBlock.vi X Χ Matrix Block.vi X Matrix Create.vi Χ X Matrix Diag.vi Χ X Matrix ElementSum.vi Χ X Matrix Exp.vi Χ X Matrix ExtractColumnVector.vi Χ X Matrix ExtractFrom.vi Χ Χ Matrix_ExtractRowVector.vi Χ Χ Matrix_Fill.vi Χ Χ Matrix_Ident.vi Χ Χ Matrix_IsEqual.vi Χ Χ Matrix_LltDecompose.vi Χ Χ Matrix_Pow.vi Χ X Matrix_SetColumn.vi Χ X Matrix SetRow.vi **Function Prototype** Notes MATRIX HELPER X XX MatrixHelper Zero.vi X X MatrixHelper CooerceSize.vi XX MatrixHelper MultCooerceBSize.vi Menu Item VI Name Function Prototype Notes VecBuilder 1x1Fill.vi VECTOR BUILDER X Χ VecBuilder_2x1Fill.vi Χ Χ Χ Χ VecBuilder_3x1Fill.vi Χ VecBuilder_4x1Fill.vi Χ Χ VecBuilder_5x1Fill.vi Χ VecBuilder_6x1Fill.vi Χ VecBuilder_7x1Fill.vi Χ VecBuilder_8x1Fill.vi

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MATH	
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VecBuilder_9x1Fill.vi VecBuilder_10x1Fill.vi VecBuilder_ArrayBy1Fill.vi

FRC LabVIEW Trajectory Library – VI Implementati	on Lis	st									
Revision 2.X 11/12/2021 – State Space Items – (This list is	s still n	nissing (one V	/I) <i>i</i>	Added a	dditional columns for test and sample.					
					timiz	ram				~	б
	nted	nted	1/8	E	r og fine	Prog			view	Test Program	Checking
	Implement	ımeı	Not WPILIB	Menu Item	Execution O _l Test Routine	ple F			e Re	Prog	Ç
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ANGLE STATISTIC	SX	7		X		AngleStats_AngleAdd.vi	71				
	X		X	X		AngleStats_AngleAdd_BiFunc.vi AngleStats_AngleMean.vi					
	X		X	X		AngleStats_AngleMean_BiFunc.vi					
	X		X	X		AngleStats_AngleResidual.vi AngleStats_AngleResidual_BiFunc.vi					
	_		^	^		Anglestats_AngleNesidual_birunc.vi					
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		ρο̈́			Exec Test		Function Prototype	Notes	<u>Š</u>	Test	E
MATH UTILIT	Y X			X X		MathUtil_AngleModulus.vi MathUtil_Clamp.vi					
	X			Χ		MathUtil_Clamp_Int.vi					
	X			X		MathUtil_InputModulus.vi					
	mplemented	ocumented	Vot WPILIB	7	Execution Optimiz Test Routine	Sample Program	Function Prototype	Notes	ode Review	Test Program	Error Checking
MERWE SCALED SIGMA POINT	_		_<	2	<u> </u>	MerweScSigPts_ComputeWeights.vi	Function Prototype	Notes			Щ
	X					MerweScSigPts_GetNumSigmas.vi					
	X					MerweScSigPts_GetWc.vi MerweScSigPts_GetWc_Single.vi					
	X					MerweScSigPts_GetWm.vi					
	X					MerweScSigPts_GetWm_Single.vi MerweScSigPts_New.vi					
	X					MerweScSigPts_New_Default.vi					
	X					MerweScSigPts_SigmaPoints.vi					
	mplemented	ocumented	Vot WPILIB		Execution Optimized Test Routine	Name And Name	Function Destatus	Nata	ode Review	Test Program	rror Checking
NUMERICAL INTEGRATIO	_	Q	_	No N	M F	ගී VI Name NumIntegrate_Func_Ax_Bu_K.vi	Function Prototype	Notes	<u> </u>	Ĕ	En
	Χ			No		NumIntegrate_Func_Bs.vi					
	X			No No		NumIntegrate_Func_Ch.vi NumIntegrate_Func_Ct.vi					
	/			, ,,,		NumIntegrate_Rk4_Dbl.vi		NOT DONE			
	/		-	~		NumIntegrate_Rk4_K_Dbl.vi		NOT DONE			
	X			X		NumIntegrate_Rk4_Mat_X.vi NumIntegrate_Rk4_Mat_X_U.vi					
	X			X		Numinegrate KK4 Wat A U.VI					
	X X X			X X No		NumIntegrate_Rkf45.vi NumIntegrate_Rkf45Impl.vi					

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	Χ	X		NumIntegrate_Trap_Dbl.vi			
	Χ	X		NumIntegrate_Trap_Mat.vi			

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
NUMERICAL JACOBIAN	X			X			NumJacobianX.vi		There are others that may implemented.	need		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Op	Test Routine	Sample Progr ≤	I Name	Function Prototype	Notes	Code Review	Test Program	Error Checkin
RICCATI	/			X			Rid	iccati_Check_Detectable.vi		Routine exists, it is just a shell			
	X			X			Rid	iccati_Check_Stabilizable.vi		Not really done !!!			
	X			X			Rid	iccati_DARE.vi					
	X			X			Rid	iccati_DARE_Iterate.vi					
	X			Χ			Ric	iccati_Input_Check.vi					

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program		Function Prototype	Notes
TypeDef	Ζ		Χ	X	N/A			ARM_FF.CTL		
	1		Χ	Χ	N/A			BICon-Matrix_FUNC_TYPE.CTL		
	Ζ		Χ	Χ	N/A			BiFun_Matrix_FUNC_TYPE.CTL		
	Ζ	X	X	Χ	N/A			CHASSIS_SPEEDS.CTL		
	Ζ	Χ	Χ	X	N/A			CONTRAINED_STATE.CTL		
	Ζ		Χ	X	N/A			DCMOTOR.CTL		
	Ζ	Χ	Χ	Χ	N/A			DIFF_DRIVE_KINEMATICS.CTL		
	Ζ		Χ		N/A			DIFF_DRIVE_Kitbot_WheelSize_ENUM.ctl		
	Ζ		Χ		N/A			DiFF_DRIVE_POSE_EST.ctl		
	Ζ		Χ		N/A			DIFF_DRIVE_ToughBoxMini_GearChoice_ENUM.ctl		
	Ζ		Χ		N/A			DIFF_DRIVE_ToughBoxMini_MotorChoice_ENUM.ctl		
	Ζ		Χ		N/A			DIFF_DRIVE_TRAIN_SIM.ctl		
	Ζ		Χ	Χ	N/A			ELEVATOR_SIM.CTL		
	Ζ		Χ	Χ	N/A			ELEV_FF.CTL		
	Ζ		Χ	Χ	N/A			EXTENDED_KALMAN_CORRECT_FUNC_GROUP.CTL		
	Ζ		Χ	X	N/A			ExTENDED_KALMAN_FILTER.CTL		
	Ζ		Χ	Χ	N/A			FLYWHEEL_SIM.ctl		
	Ζ		Χ	Χ	N/A			HOLONOMIC_DRV_CTRL.CTL		New 1/26/21
	Ζ		X	Χ	N/A			KALMAN_FILTER.ctl		

still mi	ssing				ditional columns for test and sample.	
1		X		N/A	KALMAN_FILTER_LATENCY_COMP.CTL	
Ζ	Χ	Χ	Χ	N/A	LINEAR FILTER.CTL	
Z		Х		N/A	LINEAR PLANT INV FF.ctl	
Z		X		N/A	LINEAR QUADRATIC REGULATOR.ctl	
			X		LINEAR SYSTEM LOOP.ctl	
Z		X		N/A		
Z		Χ		N/A	LINEAR_SYSTEM_SIM.ctl	
Z		Χ	Χ	N/A	LINEAR_SYSTEM.ctl	
Z	X	X	Χ	N/A	MECA DRIVE KINEMATICS.CTL	
Z	Χ	Х	Χ	N/A	MECA DRIVE ODOMETRY.CTL	
Z	X	X		N/A	MECA_WHEEL_SPEEDS.CTL	
Z		X		N/A	MEDIAN FILTER.CTL	
			^			
Z		X		N/A	MERWE_SCALED_SIGMA_PTS.ctl	
Z		Χ		N/A	OBSERVER_SNAPSHOT.CTL	
Z		Χ		N/A	OBSERVER_SNAP_LIST_ITEM.CTL	
Z	X	X	Χ	N/A	PARAM_STACK_ITEM.CTL	
Z	Χ	Х	X	N/A	PARAM STACK.CTL	
Z		Х	Χ	N/A	PID ADV LIMITS.CTL	
Z		X		N/A	PID ADV TUNING.CTL	
Z		X	X	N/A	PID CONTROLLER.CTL	
Z		Χ	Χ	N/A	PID_ERROR_TOLERANCE.CTL	
Z		Χ	Χ	N/A	PID_INPUT_LIMITS.CTL	
Z		Χ		N/A	PID_TUNING.CTL	
Z	Χ	Х		N/A	POSE2D.CTL	
Z	X	X	X	N/A	POSEwCURVATURE.CTL	
Z		X	X	N/A	PROFILED PID CONTROLLER.CTL	
	V					
Z	X	X		N/A	RAMSETE.CTL Property of the control	
Z	Χ	X		N/A	ROTATION2D.CTL	
Z		X	X	N/A	SINGLE_JOINT_ARM_SIM.CTL	
Z	Χ	X	Χ	N/A	SIMPLE MOTOR FF.CTL	
Z		Χ	Χ	N/A	SLEW RATE LIMITER.CTL	
Z	Χ	X		N/A	SPLINE CTRL VECTOR.CTL	
Z	X	X	\overline{X}	N/A	SPLINE.CTL	
Z	X	X	Χ	N/A	SWERVE_DRIVE_KINEMATICS.CTL	
Z	X	X		N/A	SWERVE_DRIVE_MODULE_STATE.CTL	
Z	X	X	Χ	N/A	SWERVE_DRIVE_ODOMETRY.CTL	
Z		X	Χ	N/A	TIMER.CTL	
Z	Χ	Х	Χ	N/A	TRAJ CONFIG.CTL	
Z	X	X		N/A	TRAJ CONSTRAINT CENTRIPETAL ACCEL.CTL	
Z	X	X		N/A	TRAJ CONSTRAINT DIFF DRIVE KINEMATICS.CTL	
Z	Χ	X	Χ	N/A	TRAJ_CONSTRAINT_DIFF_DRIVE_VOLTAGE.CTL	
1		Χ		N/A	TRAJ_CONSTRAINT_JERK.CTL	Routine exists, it is just a shell
Z	Χ	Χ		N/A	TRAJ_CONSTRAINT_MECA_DRIVE_KINEMATICS.CTL	
Z	X	Х	X	N/A	TRAJ_CONSTRAINT_MINMAX.CTL	
Z	X	X		N/A	TRAJ CONSTRAINT SWERVE DRIVE KINEMATICS.CTL	
Z	X	X		N/A	TRAJ STATE.CTL	
Z	\overline{X}	X		N/A	TRAJECTORY.CTL	
Z	X	X		N/A	TRANSFORM2D.CTL	
Z	Χ	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		N/A	TRAPEZOID PROFILE.CTL	
Z	Χ	X		N/A	TWIST2D.CTL	
Z				N/A	UNSCENTED KALMAN FILTER.ctl	
		X			UNSCENTED_KALMAN_FILTER.CII UNSCENTED KALMAN NEW FUNC GROUP.CTL	
Z		X		N/A		
Ζ		Χ		N/A	UNSCENTED_KALMAN_CORRECT_FUNC_GROUP.CTL	
Z	X	X		N/A	UTIL_PATHFINDER_CONFIG.CTL	
Z	X	X	Χ	NA	UTIL_WAYPOINT.ctl	
Z		Χ	Χ	NA	UTIL_WEIGHTED_WAYPOINT.ctl	New V1.5
N/A		N/A		N/A	WAYPOINTS.CTL	Delete – obsolete
Z		X	Χ	NA		New V1.5
		N/A	^		X Y HEADINGS.CTL	Delete – obsolete
N/A		N/A		N/A	N_I_TIEADINGO.CIE	Delete - Obsolete

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