FRC LabVIEW Trajectory Library – VI Implementation List

Revision 2.X 12/07/2021 – Added Bang/Bang – (not very useful)

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...

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program
VI / CTL Totals	805	805	243	769	424	26	12
VI Total (X)	722						
CTL Total (Z)	83						
VI Shell Total (/)	6						
CTRL Shell Total (\)	2						

Doc completed Pct
100.00%
Optimization Pct
52.67%

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

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BASE
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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
LINEAR FILTER	X	X		X	I			LinearFilter_BackwardFiniteDifference.vi		
	X	X		X	SI			LinearFilter_Calculate.vi		
	X	X	X	X	X			LinearFilter_CutoffFrequency.vi		
	X	X	X	X	I		X	LinearFilter_Execute.vi		Labview style helper
	X	X		No	I			LinearFilter_Factorial.vi		AN INTERNAL ROUTINE
	X	X		X	X			LinearFilter_HighPass.vi		
	X	X	X	X	X			LinearFilter_HighPassBW1.vi		
	X	X	X	X	X			LinearFilter_HighPassBW2.vi		
	X	X	X	X	X			LinearFilter_LowPassBW1.vi		
	X	X	X	X	X			LinearFilter_LowPassBW2.vi		
	X	X		X	X			LinearFilter_MovingAverage.vi		
	X	X		X	I			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	X			MedianFilter_Calculate.vi		
	X	X	X	X	I		X	MedianFilter_Execute.vi		Labview style helper
	X	X		X	SI			MedianFilter_New.vi		
	X	X		X	SI			MedianFilter_Reset.vi		
	X	X	X	X	SI			MedianFilter_ResetToValue.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
SLEW RATE FILTER	X	X		X	I			SlewRateLimiter_Calculate.vi		
	X	X	X	X	SI			SlewRateLimiter_Close.vi		
	X	X	X	X	I		X	SlewRateLimiter_Execute.vi		Labview style helper
	X	X	X	X	SI			SlewRateLimiter_GetRate.vi		
	X	X		X	I			SlewRateLimiter_New.vi		
	X	X		X	I			SlewRateLimiter_NewInitialZero.vi		
	X	X		X	I			SlewRateLimiter_Reset.vi		
	X	X		X	SI			SlewRateLimiter_SetRate.vi		

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
DIG SEQ LOGIC	X	X	X	X				DigSeqLogic_On_Delay.vi		
	X	X	X	X				DigSeqLogic_Off_Delay.vi		
	X	X	X	X				DigSeqLogic_One_Shot.vi		
	X	X	X	X				DigSeqLogic_SR_Flip_Flop.vi		

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CONTROLLER
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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
ARM FF	X	X		X				ArmFF_Calculate.vi		
	X	X		X				ArmFF_CalculateVelocityOnly.vi		
			X					ArmFF_Execute.vi		LabVIEW style single call

		X					ArmFF_ExecuteVelocityOnly.vi		LabVIEW style single call
X	X		X				ArmFF_MaxAchieveAccel.vi		
X	X		X				ArmFF_MaxAchieveVelocity.vi		
X	X		X				ArmFF_MinAchieveAccel.vi		
X	X		X				ArmFF_MinAchieveVelocity.vi		
X	X		X				ArmFF_New_ZeroGravity.vi		
X	X		X				ArmFF_New.vi		

	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes
BANG BANG	X	X		X	SI			BangBang_AtSetpoint.vi		
	X	X		X	SI			BangBang_Calculate_PV.vi		
	X	X		X	SI			BangBang_Calculate_SP_PV.vi		
	X	X	X	X	SI			BangBang_Execute.vi		
	X	X		X	SI			BangBang_GetAll.vi		
	X	X		X	SI			BangBang_GetError.vi		
	X	X		X	SI			BangBang_New.vi		
	X	X		X	SI			BangBang_SetSetpoint.vi		
	X	X		X	SI			BangBang_SetTolerance.vi		

	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes
CONTROLLER UTIL	X	X		X	SI			ControllerUtil_GetModulusError.vi		This was short lived in WPILIB, but still useful here.

	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes
ELEV FF	X	X		X				ElevFF_Calculate.vi		
	X	X		X				ElevFF_CalculateVelocityOnly.vi		
			X					ElevFF_Execute.vi		LabVIEW style single call
			X					ElevFF_ExecuteVelocityOnly.vi		LabVIEW style single call
	X	X		X				ElevFF_MaxAchieveAccel.vi		
	X	X		X				ElevFF_MaxAchieveVelocity.vi		
	X	X		X				ElevFF_MinAchieveAccel.vi		
	X	X		X				ElevFF_MinAchieveVelocity.vi		
	X	X		X				ElevFF_New_ZeroAccel.vi		
	X	X		X				ElevFF_New.vi		

	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes
HOL_DRV_CTRL	X	X		X	SI			HolDrvCtrl_AtReference.vi		Added 1/26/21
	X	X		X	I			HolDrvCtrl_Calculate_Trajectory.vi		Added 1/26/21
	X	X		X	I			HolDrvCtrl_Calculate.vi		Added 1/26/21
			X					HolDrvCtrl_Execute_Trajectory.vi		Future
			X					HolDrvCtrl_Execute.vi		Future

	X	X		X	SI			HolDrvCtrl_New.vi	Added 1/26/21
	X	X		X	SI			HolDrvCtrl_SetEnabled.vi	Added 1/26/21
	X	X		X	SI			HolDrvCtrl_SetTolerance.vi	Added 1/26/21

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
PID CONTROLLER	X	X	X	X				PIDController_AdvCalculate_FF_Sp_Pv_Per.vi		Advanced PID
	X	X	X	X				PIDController_AdvCalculate_FF_Sp_Pv.vi		Advanced PID
	X	X	X	X			X	PIDController_AdvExecute.vi		Labview style helper. Advanced PID
	X	X		X	SI			PIDController_AtSetpoint.vi		
	X	X		X				PIDController_Calculate_PV.vi		
	X	X		X				PIDController_Calculate_SP_PV.vi		
	X	X		X	SI			PIDController_DisableContinousInput.vi		
	X	X		X	SI			PIDController_EnableContinousInput.vi		
	X	X	X	X			X	PIDController_Execute.vi		Labview style helper
								PIDController_GetContinuousError.vi		OBSOLETE – Removed
	X	X		X	SI			PIDController_GetPeriod.vi		
	X	X		X	SI			PIDController_GetPID.vi		
	X	X		X	SI			PIDController_GetPositionError.vi		
	X	X		X	SI			PIDController_GetSetpoint.vi		
	X	X		X	SI			PIDController_GetVelocityError.vi		
	X	X		X	SI			PIDController_IsContinuousInputEnabled.vi		
	X	X		X	I			PIDController_New.vi		
	X	X		X	I			PIDController_NewPeriod.vi		
	X	X	X	X	SI			PIDController_Pack_AdvLimits.vi		
	X	X	X	X	SI			PIDController_Pack_AdvTuning.vi		
	X	X	X	X	SI			PIDController_Pack_ErrorTolerance.vi		
	X	X	X	X	SI			PIDController_Pack_InputLimits.vi		
	X	X	X	X	SI			PIDController_Pack_Tuning.vi		
	X	X		X	SI			PIDController_Reset.vi		
	X	X		X	SI			PIDController_SetD.vi		
	X	X	X	X	SI			PIDController_SetDerivativeFilter.vi		Advanced PID
	X	X	X	No				PIDController_SetFeedForward_OBSOLETE_DELETE.vi		Advanced PID, Obsolete – DELETE
	X	X	X	No				PIDController_SetFFGain_OBSOLETE_DELETE.vi		Advanced PID, Obsolete – DELETE
	X	X		X	SI			PIDController_SetI.vi		
								PIDController_SetInputRange.vi		OBSOLETE – Removed
	X	X		X	SI			PIDController_SetIntegratorRange.vi		
	X	X	X	X	SI			PIDController_SetOutputLimits.vi		Advanced PID
	X	X		X	SI			PIDController_SetP.vi		
	X	X	X	X	SI			PIDController_SetPeriod.vi		
	X	X		X	SI			PIDController_SetPID.vi		
	X	X	X	X	SI			PIDController_SetPIDF.vi		Advanced PID
	X	X		X	SI			PIDController_SetSetpoint.vi		
	X	X		X	SI			PIDController_SetTolerance.vi		
	X	X		X	SI			PIDController_SetTolerancePandV.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
PROFILED PID CONTROLLER	X	X		X	SI			ProfiledPIDController_AtGoal.vi		
	X	X		X	SI			ProfiledPIDController_AtSetpoint.vi		
	X	X		X				ProfiledPIDController_Calculate_Meas_Goal.vi		
	X	X		X				ProfiledPIDController_Calculate_Meas_StateGoal_TrapCnsrt.vi		
	X	X		X				ProfiledPIDController_Calculate_Meas_StateGoal.vi		

	X	X		X				ProfiledPIDController_Calculate_Meas.vi		
	X	X		X	SI			ProfiledPIDController_DisableContInput.vi		
	X	X		X	SI			ProfiledPIDController_EnableContInput.vi		
	X	X		X	SI			ProfiledPIDController_GetGoal.vi		
	X	X		X	SI			ProfiledPIDController_GetPeriod.vi		
	X	X	X	X	SI			ProfiledPIDController_GetPID.vi		WPILIB has separate getters.
	X	X		X	SI			ProfiledPIDController_GetPositionError.vi		
	X	X		X	SI			ProfiledPIDController_GetSetpoint.vi		
	X	X		X	SI			ProfiledPIDController_GetVelocityError.vi		
	X	X		X	I			ProfiledPIDController_New.vi		
	X	X		X	I			ProfiledPIDController_NewPeriod.vi		
	X	X		X	SI			ProfiledPIDController_Reset_PosOnly.vi		
	X	X		X	SI			ProfiledPIDController_Reset_PosVel.vi		
	X	X		X	SI			ProfiledPIDController_Reset.vi		
	X	X		X	SI			ProfiledPIDController_SetConstraints.vi		
	X	X		X	SI			ProfiledPIDController_SetGoal_PosOnly.vi		
	X	X		X	SI			ProfiledPIDController_SetGoal.vi		
	X	X		X	SI			ProfiledPIDController_SetIntegratorRange.vi		
	X	X		X	SI			ProfiledPIDController_SetPID.vi		
	X	X		X	SI			ProfiledPIDController_SetTolerance_PosOnly.vi		
	X	X		X	SI			ProfiledPIDController_SetTolerance_PosVel.vi		

	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes
RAMSETE	X	X		X	SI			Ramsete_AtReference.vi	AtReference	
	X	X		X	X			Ramsete_Calculate_Trajectory.vi	calculate_trajectory	
	X	X		X	X			Ramsete_Calculate.vi	calculate	
	X	X	X	X	X			Ramsete_Diff_DO_Eng.vi		
	X	X	X	X	X			Ramsete_Diff_DO_SI.vi		
	X	X	X	X	I			Ramsete_Execute_ENG.vi	Use this one!!	
	X	X	X	X	SI			Ramsete_Execute_PackTuning_ENG.vi		
	X	X	X	X	SI			Ramsete_Execute_PackTuning.vi		
	X	X	X	X	I			Ramsete_Execute.vi		
	X	X		X	SI			Ramsete_New_B_Z.vi	new(b, zeta)	
	X	X		X	SI			Ramsete_New.vi	new	
	X	X		X	SI			Ramsete_SetEnabled.vi	SetEnabled	
	X	X		X	SI			Ramsete_SetTolerance.vi	SetTolerance	
	X	X		X	X			Ramsete_SINC.vi	sinc	internal

	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes
SIMPLE MOTOR FEEDFORWARD	X	X	X	X	SI			SimpleMotorFF_Calculate_CalcAccel.vi		
	X	X		X				SimpleMotorFF_Calculate_NextV_Dt.vi		
	X	X		X	SI			SimpleMotorFF_Calculate.vi	public double calculate(double velocity, double acceleration)	
	X	X		X	SI			SimpleMotorFF_CalculateVelocityOnly.vi	public double calculate(double velocity)	
	X	X		X	X			SimpleMotorFF_MaxAchieveAccel.vi	public double maxAchievableAcceleration(double maxVoltage, double velocity)	
	X	X		X	X			SimpleMotorFF_MaxAchieveVel.vi	public double maxAchievableVelocity(double maxVoltage, double acceleration)	
	X	X		X	X			SimpleMotorFF_MinAchieveAccel.vi	public double minAchievableAcceleration(double maxVoltage, double velocity)	
	X	X		X	X			SimpleMotorFF_MinAchieveVel.vi	public double minAchievableVelocity(double maxVoltage, double acceleration)	
	X	X		X	SI			SimpleMotorFF_New.vi	public SimpleMotorFeedforward(double ks, double kv, double ka)	
									public SimpleMotorFeedforward(double ks, double kv)	

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

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TRANSFORM	X	X		X	SI			Transform_Create_PosePose.vi	transform2d new(pose2d, pose2d)	
	X	X		X	SI			Transform_Create_TransRot.vi	transform2d new(translation2d, rotation2d)	
	X	X		X	SI			Transform_Equals.VI	boolean equals(other transform2d)	
	X	X		X	SI			Transform_GetRotation.VI	rotation2d getRotation()	use cluster unpack
	X	X		X	SI			Transform_GetTranslation.VI	translation2d getTranslation()	use cluster unpack
	X	X	X	X	SI			Transform_GetXY.vi		
	X	X	X	X	SI			Transform_GetXYAngle.vi		

	X	X		X	SI			Transform_Inverse.vi	transform inverse()	new
	X	X		X	Si			Transform_Plus.vi		
	X	X		X	SI			Transform_Times.vi	transform2d times(double scalar)	
									transform2d new( )	can use cluster constant

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TRANSLATION	X	X		X	SI			Translation_Create_DistAng.vi		
	X	X		X	SI			Translation_Create.vi	translation2d new(double x, double y)	
	X	X		X	SI			Translation_Equals.vi	boolean equals(translation other)	
	X	X		X	SI			Translation_GetDistance.vi	double getDistance(translation2d other)	
	X	X		X	SI			Translation_GetNorm.VI	double getNorm()	can use cluster unpack
	X	X		X	SI			Translation_GetX.VI	double getX()	can use cluster unpack
	X	X	X	X	SI			Translation_GetXY.VI		
	X	X		X	SI			Translation_GetY.VI	double getY()	can use cluster unpack
	X	X		X	SI			Translation_Minus.vi	translation2d minus(translation2d other)	
	X	X		X	SI			Translation_Plus.vi	translation2d plus(translation2d other)	
	X	X		X	SI			Translation_RotateBy.vi	translation2d rotateBy(rotation2d other)	
	X	X		X	SI			Translation_Times.vi	translation2d times(double scalar)	
	X	X		X	SI			Translation_UnaryMinus.vi	translation2d unaryminus( )	
									translation2d new()	can use cluster constant
									translation2d div(double scalar)	can multiply by 1/scalar

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TWIST	X	X		X	SI			Twist_Create.vi	twist new(x, y, theta)	
	X	X		X	SI			Twist_Equals.VI	boolean equals(obj other)	
	X	X	X	X	SI			Twist_GetAll.VI		

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KINEMATICS
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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
CHASSIS SPEEDS	X	X		X	SI			ChassisSpeeds_FromFieldRelativeSpeeds.VI	chassisspeeds fromFieldRelativeSpeeds(double x, double y, double angvel, rotation2d robotangle)	
	X	X	X	X	SI			ChassisSPeeds_GetXYOmega.vi		
	X	X		X	SI			ChassisSpeeds_New.vi	chassisspeeds new (double xvel, double yvel, double angvel)	
									chassisspeeds new ()	can use cluster constant

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
DIFFERENTIAL DRIVE KINEMATICS	X	X		X	I	X		DiffKinematics_New.vi	diffDriveKine new(double trackWidth)	
	X	X		X	X	X		DiffKinematics_toChassisSpeed.vi	chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds)	
	X	X		X	SI	X		DiffKinematics_toWheelSpeed.vi	diffDriveWheelSpeed toWheelSpeeds(chassisSpeeds)	

DIFFERENTIAL DRIVE ODOMETRY

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
		X					DiffOdometry_Execute.vi		DONT NEED
X	X		X	X			DiffOdometry_Update.vi	pose2d update(rotation2d gyro, double leftdist, double right dist)	Incorporates enhanced reset
								diffDrOdom new(rotation gyro, pose initial)	
								diffDrOdom new(rotation gyro)	
								void resetPosition(pose2d, rotation2d)	incorporated into “update”
								pose2d getPoseMeters()	

DIFFERENTIAL DRIVE WHEEL SPEEDS

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
								diffDrWheelSpeeds new()	
								diffDrWheelSpeeds new(double leftVel, double rightVel)	
X	X		X	X			DiffWheel_Normalize.vi	void normalize(double maxVel)	

MECANUM DRIVE KINEMATICS

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
X	X		X	I			MecaKinematics_New.vi		
X	X		X	X			MecaKinematics_SetInverseKinematics.vi		
X	X		X	X			MecaKinematics_ToChassisSpeeds.vi		
X	X		X	X			MecaKinematics_ToWheelSpeeds.vi		
X	X		X	X			MecaKinematics_ToWheelSpeedsZeroCenter.vi		

MECANUM DRIVE MOTOR VOLTAGE

nothing done

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes

MECANUM DRIVE ODOMETRY

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
		X					MecaOdometry_Execute.vi		
X	X		X				MecaOdometry_GetPose.vi		
X	X		X				MecaOdometry_New.vi		
X	X		X				MecaOdometry_NewDefaultPose.vi		
X	X		X				MecaOdometry_Reset.VI		
X	X		X				MecaOdometry_Update.vi		
X	X		X				MecaOdometry_UpdateWithTime.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
MECANUM DRIVE WHEEL SPEEDS	X	X		X	SI			MecaWheel_New.Vi	public MecanumDriveWheelSpeeds(double frontLeftMetersPerSecond, double frontRightMetersPerSecond, double rearLeftMetersPerSecond, double rearRightMetersPerSecond)	
	X	X		X	X			MecaWheel_Normalize.vi	public void normalize(double attainableMaxSpeedMetersPerSecond)	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
SWERVE DRIVE KINEMATICS	X	X	X	X				SwerveKinematics_New4.VI		For 4 module drives
	X	X	X	X				SwerveKinematics_NewX.VI		uses array as input
	X	X	X	X				SwerveKinematics_NormalizeWheelSpeeds.vi	public static void normalizeWheelSpeeds(SwerveModuleState[] moduleStates, double attainableMaxSpeedMetersPerSecond)	
	X	X	X	X				SwerveKinematics_ToChassisSpeeds4.VI		For 4 module drives
	X	X	X	X				SwerveKinematics_ToChassisSpeedsX.VI		uses array as input
	X	X		X				SwerveKinematics_ToSwerveModuleStates.VI	public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds, Translation2d centerOfRotationMeters)	
	X	X		X				SwerveKinematics_ToSwerveModuleStatesZeroCenter.VI	public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds)	
									public SwerveDriveKinematics(Translation2d... wheelsMeters)	variable parameters (replace with array and “4” calls)
									public ChassisSpeeds toChassisSpeeds(SwerveModuleState... wheelStates)	variable parameters (replace with array and “4” calls)

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
SWERVE DRIVE ODOMETRY								SwerveOdometry_Execute4.vi		
								SwerveOdometry_ExecuteX.vi		
	X	X		X				SwerveOdometry_GetPosition.VI	public Pose2d getPoseMeters()	
	X	X		X				SwerveOdometry_New.VI	public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose)	
	X	X		X				SwerveOdometry_NewZeroCenter.VI	public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle)	
	X	X		X				SwerveOdometry_ResetPosition.VI	public void resetPosition(Pose2d pose, Rotation2d gyroAngle)	
	X	X	X	X				SwerveOdometry_Update4.VI		For 4 module drives
	X	X	X	X				SwerveOdometry_UpdateWithTime4.VI		For 4 module drives
	X	X	X	X				SwerveOdometry_UpdateWithTimeX.VI		uses array as input
	X	X	X	X				SwerveOdometry_UpdateX.VI		uses array as input
									public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState... moduleStates)	variable parameters (replace with array and “4” calls)
									public Pose2d update(Rotation2d gyroAngle, SwerveModuleState... moduleStates)	variable parameters (replace with array and “4” calls)

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
SWERVE DRIVE MODULE STATE	X	X		X	SI			SwerveModuleState_CompareTo.vi	public int compareTo(SwerveModuleState o)	
				X	SI			SwerveModuleState_Get.vi		
	X	X		X	SI			SwerveModuleState_New.vi	public SwerveModuleState(double speedMetersPerSecond, Rotation2d angle)	
	X	X		X	SI			SwerveModuleState_Optimize.vi	public SwerveModuleState optimize(SwerveModuleState desired, Rotation2d angle)	

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
CUBIC HERMITE SPLINE								`	protected SimpleMatrix getCoefficients()	not needed, use cluster unpack
	X	X		X				CubicHermiteSpline_getControlVectorFromArrays.vi	private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector)	
	X	X		X				CubicHermiteSpline_makeHermiteBasis.vi	private SimpleMatrix makeHermiteBasis()	
	X	X		X				CubicHermiteSpline_New.vi	public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector)	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
POSE WITH CURVATURE	X	X		X	SI			PoseWithCurve_New.vi	public PoseWithCurvature(Pose2d poseMeters, double curvatureRadPerMeter)	
									public PoseWithCurvature()	can use cluster constant
									public Pose2d poseMeters	not needed, use cluster unpack
									public double curvatureRadPerMeter..	not needed, use cluster unpack

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
QUINTIC HERMITE SPLINE	X	X		X				QuinticHermiteSpline_getControlVectorFromArrays.vi	private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector)	
	X	X		X				QuinticHermiteSpline_makeHermiteBasis.vi	private SimpleMatrix makeHermiteBasis()	
	X	X		X				QuinticHermiteSpline_New.vi	public QuinticHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector)	
									protected SimpleMatrix getCoefficients()	not needed, use cluster unpack

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
SPLINE (Abstract class)	X	X		X				Spline_getPoint.vi	public PoseWithCurvature getPoint(double t)	
									Spline(int degree)	
									public static class ControlVector	
									public ControlVector(double[] x, double[] y)	implemented as data structure

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
SPLINE HELPER	X	X		X	SI			SplineHelp_GetCubicCtrlVector.vi	private static Spline.ControlVector getCubicControlVector(double scalar, Pose2d point)	
	X	X		X		X		SplineHelp_GetCubicCtrlVectorsFromWayPts.vi	public static Spline.ControlVector[] getCubicControlVectorsFromWaypoints(Pose2d start, Translation2d[] interiorWaypoints, Pose2d end)	
	X	X	X	X				SplineHelp_GetCubicCtrlVectorsFromWeightedWayPts.vi		
	X	X	X	No				SplineHelp_GetCubicSpline_Calc1.vi		internal
	X	X	X	No				SplineHelp_GetCubicSpline_Calc2.vi		internal
	X	X	X	No				SplineHelp_GetCubicSpline_Calc3.vi		internal
	X	X		X		X		SplineHelp_getCubicSplinesFromControlVectors.vi	public static CubicHermiteSpline[] getCubicSplinesFromControlVectors(Spline.ControlVector start, Translation2d[] waypoints, Spline.ControlVector end)	
	X	X		X	SI			SplineHelp_GetQuinticCtrlVector.vi	private static Spline.ControlVector getQuinticControlVector(double scalar, Pose2d point)	
	X	X		X				SplineHelp_GetQuinticCtrlVectorsFromWayPts.vi	public static List<Spline.ControlVector> getQuinticControlVectorsFromWaypoints(List<Pose2d> waypoints)	
	X	X	X	X				SplineHelp_GetQuinticCtrlVectorsFromWeightedWayPts.vi		
	X	X		X				SplineHelp_getQuinticSplinesFromControlVectors.vi	public static QuinticHermiteSpline[] getQuinticSplinesFromControlVectors(Spline.ControlVector[] controlVectors)	
	X	X		No				SplineHelp_ThomasAlgorithm.vi	private static void thomasAlgorithm(double[] a, double[] b, double[] c, double[] d, double[] solutionVector)	internal

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
SPLINE PARAMETERIZER	X	X		X				SplineParam_Spline_T0_T1.vi	public static List<PoseWithCurvature> parameterize(Spline spline, double t0, double t1)	
	X	X		X		X		SplineParam_Spline.vi	public static List<PoseWithCurvature> parameterize(Spline spline)	
	X	X	X	No				SplineParam_StackGet.vi		internal
	X	X	X	No				SplineParam_StackPop.vi		internal
	X	X	X	No				SplineParam_StackPush.vi		internal

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TRAJECTORY	X	X		X				Trajectory_Concatenate.vi		
	X	X		X				Trajectory_equals.vi	boolean equals(other obj)	FUTURE
	X	X		X	SI			Trajectory_GetStates.vi	public List<State> getStates()	not needed, use unpack
	X	X		X	SI			Trajectory_GetTotalTime.vi	public double getTotalTimeSeconds()	not needed, use unpack
	X	X		No	SI			Trajectory_lerp_double.vi	private static double lerp(double startValue, double endValue, double t)	internal
	X	X		No	SI			Trajectory_lerp_Pose.vi	private static Pose2d lerp(Pose2d startValue, Pose2d endValue, double t)	internal
	X	X		X	SI			Trajectory_New_Empty.vi		
	X	X		X	SI			Trajectory_New.vi	public Trajectory(final List<State> states)	
	X	X		X				Trajectory_RelativeTo.vi	public Trajectory relativeTo(Pose2d pose)	
	X	X		X				Trajectory_Sample.vi	public State sample(double timeSeconds)	
	X	X	X	X				Trajectory_SampleReverse.vi		Sample in reverse order. Negate sample.
	X	X		X				Trajectory_TransformBy.vi	public Trajectory transformBy(Transform2d transform)	
									public Pose2d getInitialPose()	can use cluster unpack, array index

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TRAJECTORY_STATE	X	X		X	SI			TrajectoryState_Equals.vi	boolean equals(other obj)	
	X	X	X	X	SI			TrajectoryState_GetAll.vi		
	X	X		X	SI			TrajectoryState_GetPose.vi		
	X	X		X				TrajectoryState_Interpolate.vi	State interpolate(State endValue, double i)	
	X	X		X	SI			TrajectoryState_New.vi	public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter)	
									public State()	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TRAJECTORY CONFIG	X	X		X	SI			TrajectoryConfig_Create.vi	public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq)	
	X	X	X	X	SI			TrajectoryConfig_setCentripetalAccel.vi		
	X	X		X	SI			TrajectoryConfig_setKinematicsDiffDrive.vi	public TrajectoryConfig setKinematics(DifferentialDriveKinematics kinematics)	
	X	X		X	SI			TrajectoryConfig_setKinematicsMecanumfDrive.vi	public TrajectoryConfig setKinematics(MecanumDriveKinematics kinematics)	
	X	X		X	SI			TrajectoryConfig_setKinematicsSwerveDrive.vi	public TrajectoryConfig setKinematics(SwerveDriveKinematics kinematics)	
	X	X		X	SI			TrajectoryConfig_setReversed.vi	public TrajectoryConfig setReversed(boolean reversed)	
	X	X	X	X	SI			TrajectoryConfig_setVoltageDiffDrive.vi		
									public TrajectoryConfig addConstraint(TrajectoryConstraint constraint)	Implemented differently, can't duplicate.
									public TrajectoryConfig addConstraints(List<? extends TrajectoryConstraint> constraints)	Implemented differently, can't duplicate.
									public double getStartVelocity()	can use cluster unpack
									public TrajectoryConfig setStartVelocity(double startVelocityMetersPerSecond)	

								public double getEndVelocity()	can use cluster unpack
								public TrajectoryConfig setEndVelocity(double endVelocityMetersPerSecond)	
								public double getMaxVelocity()	can use cluster unpack
								public double getMaxAcceleration()	can use cluster unpack
								public List<TrajectoryConstraint> getConstraints()	Implemented differently, can't duplicate.
								public boolean isReversed()	can use cluster unpack
								NOTE ADD OTHER "SET" ROUTINES FOR OTHER CONTRAINTS HERE, SINCE NEW CONTRAINTS ARE SPECIFIC AND NOT GENERIC.	

	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes
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)	uses cubic splines
	X	X		X				TrajectoryGenerate_Make_Cubic.vi	public static Trajectory generateTrajectory(Pose2d start, List<Translation2d> interiorWaypoints, Pose2d end, TrajectoryConfig config)	uses cubic splines
	X	X	X	X				TrajectoryGenerate_Make_Generic.vi	Helper to bring these all together….	Use this one!!!
	X	X		X				TrajectoryGenerate_Make_Quintic_CtrlVect.vi	public static Trajectory generateTrajectory(ControlVectorList controlVectors, TrajectoryConfig config)	uses quintic splines
	X	X		X				TrajectoryGenerate_Make_Quintic.vi	public static Trajectory generateTrajectory(List<Pose2d> waypoints, TrajectoryConfig config)	uses quintic splines
	X	X		X				TrajectoryGenerate_splinePointsFromSplines.vi	public static List<PoseWithCurvature> splinePointsFromSplines(Spline[] splines)	

	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes
TRAJECTORY GENERATE (Control Vector)									public ControlVectorList(int initialCapacity)	may not need, just data
									public ControlVectorList()	may not need, just data
									public ControlVectorList(Collection<? extends Spline.ControlVector> collection)	may not need, just data

	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes
TRAJECTORY PARAMETERIZE	X	X	X	No				TrajectoryParam_calcStuffFwd.vi		
	X	X	X	No				TrajectoryParam_calcStuffRev.vi		
	X	X		No				TrajectoryParam_enforceAccel.vi	private static void enforceAccelerationLimits(boolean reverse, List<TrajectoryConstraint> constraints, ConstrainedState state)	This routines needs to be changed when new constraints are added.
	X	X	X	No				TrajectoryParam_enforceVelocity.vi		This routines needs to be changed when new constraints are added.
	X	X		X				TrajectoryParam_timeParam.vi	public static Trajectory timeParameterizeTrajectory(List<PoseWithCurvature> points. List<TrajectoryConstraint> constraints, double startVelocityMetersPerSecond, double endVelocityMetersPerSecond, double maxVelocityMetersPerSecond, double ~~maxAccelerationMetersPerSecondSq, boolean reversed)~~	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TRAJECTORY PARAMETERIZE CONSTRAINED STATE	X	X		X				ConstrainedState_New.vi	ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double maxAccelerationMetersPerSecondSq)	
	X	X	X	X				ConstrainedState_SetMaxAccel.vi		
	X	X	X	X				ConstrainedState_SetMinAccel.vi		
	X	X	X	X				ConstrainedState_SetVelAccel.vi		
	X	X	X	X				ConstrainedState_SetVelocity.vi		
									ConstrainedState()	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TRAJECTORY UTIL	X	X		X				TrajectoryUtil_fromPathWeaverJSON.vi	public static Trajectory fromPathweaverJson(Path path)	
	X	X	X	X	X			TrajectoryUtil_MakeWeightedWayPoint_ENG.vi		
	X	X	X	X	X			TrajectoryUtil_MakeWeightedWayPoint.vi		
	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)	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TRAPEZOID PROFILE	X	X		X				TrapProfConstraint_New.vi		
	X	X		X				TrapProfile_Calculate.vi		
	X	X		No				TrapProfile_Direct.vi		Private, remove from menu
	X	X	X	X				TrapProfile_Execute.vi		
	X	X	X	X	SI			TrapProfile_Execute_AtGoal.vi		
	X	X		X				TrapProfile_IsFinished.vi		
	X	X		X				TrapProfile_New_DefInitial.vi		
	X	X		X				TrapProfile_New.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		

'============
TRAJECTORY CONSTRAINT
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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
CENTRIPETAL ACCELERATION CONSTRAINT	X	X		X				CentripetalAccelConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	

	X	X		X				CentripetalAccelConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X	SI			CentripetalAccelConstraint_New.vi	public CentripetalAccelerationConstraint(double maxCentripetalAccelerationMetersPerSecondSq)	Can use cluster pack for now

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
DIFF DRIVE KINEMATIC CONSTRAINT	X	X		X				DiffDriveKinematicsConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X				DiffDriveKinematicsConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X	SI			DiffDriveKinematicsConstraint_New.vi	public DifferentialDriveKinematicsConstraint(final DifferentialDriveKinematics kinematics, double maxSpeedMetersPerSecond)	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
DIFF DRIVE VOLTAGE CONSTRAINT	X	X		X				DiffDriveVoltageConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X				DiffDriveVoltageConstraint_getMinMaxAccel.vi	public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	X	X		X	SI			DiffDriveVoltageConstraint_New.vi	public DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage)	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
JERK CONSTRAINT	/		X					JerkConstraint_getMaxVelocity.vi	Routine exists, it is just a shell	FUTURE
	/		X					JerkConstraint_getMinMaxAccel.vi	Routine exists, it is just a shell	FUTURE
	/		X		SI			JerkConstraint_New.vi	Routine exists, it is just a shell	FUTURE

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
MECANUM DRIVE KINEMATICS CONSTRAINT	X	X		X				MecaDriveKinematicsConstraint_getMaxVelocity.vi		
	X	X		X				MecaDriveKinematicsConstraint_getMinMaxAccel.vi		
	X	X		X	SI			MecaDriveKinematicsConstraint_New.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
SWERVE DRIVE KINEMATICS CONSTRAINT	X	X		X				SwerveDriveKinematicsConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	
	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

TRAJECTORY CONSTRAINT

Interface class - nothing done (not needed)

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TRAJECTORY CONSTRAINT (Min Max)	X	X		X	SI			Constraint_MinMax_New.vi	Constraint_MinMax_New	
	X	X		X	SI			Constraint_MinMax_NewMinMax.VI	Constraint_MinMax_New	

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

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

	X	X	X	X				Util_WeightedWaypiont_Eng_To_WeightedWaypoint		
	X	X	X	No				Util_WeightedWayPoint_To_WeightedWayPoint.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 Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes
CONV	X	X	X	X	SI			Conv_AngleDegrees_Heading.vi		
	X	X	X	X	SI			Conv_AngleRadians_Heading.vi		
	X	X	X	X	SI			Conv_Centimeters_Meters.vi		
	X	X	X	X	SI			Conv_Deg_Radians.vi		
	X	X	X	X	SI			Conv_Feet_Meters.vi		
	X	X	X	X	SI			Conv_GyroDegrees_Heading.vi		
	X	X	X	X	SI			Conv_Heading_AngleRadians.vi		
	X	X	X	X	SI			Conv_Inches_Meters.vi		
	X	X	X	X	SI			Conv_Kilograms_Pounds.vi		
	X	X	X	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		
	X	X	X	X	SI			Conv_Radians_Deg.vi		
	X	X	X	X	SI			Conv_Yards_Meters.vi		

	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes
UNITS	X	X		X	SI			Units_DegreesToRadians.vi		
	X	X		X	SI			Units_FeetToMeters.vi		
	X	X		X	SI			Units_InchesToMeters.vi		
	X	X		X	SI			Units_MetersToFeet.vi		
	X	X		X	SI			Units_MetersToInches.vi		
	X	X		X	SI			Units_MillisecondsToSeconds.vi		
	X	X		X	SI			Units_RadiansPerSecondToRotationsPerMinute.vi		
	X	X		X	SI			Units_RadiansToDegrees.vi		
	X	X		X	SI			Units_RotationsPerMinuteToRadiansPerSecond.vi		
	X	X		X	SI			Units_SecondsToMilliseconds.vi		

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

	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes
PATHFINDERUTIL	X	X	X	X				PathfinderUtil_Continuous_Heading_Difference.vi		
	X	X	X	X				PathfinderUtil_OptimizeTrajectoryStates.vi		

X	X	X	X				PathfinderUtil_ToTrajectory.vi		
X	X	X	X				PathfinderUtil_ToTrajectoryStates.vi		

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DC MOTOR	X	X		X	SI			DCMotor_GetAndymark9015.vi					
	X	X		X	SI			DCMotor_GetAndymarkRs775_125.vi					
	X	X		X	SI			DCMotor_GetBag.vi					
	X	X		X	SI			DCMotor_GetBanebotsRs550.vi					
	X	X		X	SI			DCMotor_GetBanebotsRs775.vi					
	X	X		X	SI			DCMotor_GetCIM.vi					
	X	X		X	SI			DCMotor_GetCurrent.vi					
	X	X		X	SI			DCMotor_GetFalcon500.vi					
	X	X		X	SI			DCMotor_GetMiniCIM.vi					
	X	X		X	SI			DCMotor_GetNEO.vi					
	X	X		X	SI			DCMotor_GetNEO550.vi					
	X	X		X	SI			DCMotor_GetRomiBuiltIn.vi					
	X	X		X	SI			DCMotor_GetVex775Pro.vi					
	X	X		X	SI			DCMotor_New.vi					
	X	X		X	SI			DCMotor_PickMotor.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	X	X		X				LinearSystemId_CreateDriveTrainVelocitySystem.vi		Update to use create matrix			
	X	X		X				LinearSystemId_CreateElevatorSystem.vi		Update to use create matrix			
	X	X		X				LinearSystemId_CreateFlywheelSystem.vi		Update to use create matrix			
	X	X		X				LinearSystemId_CreateSingleJointedArmSystem.vi		Update to use create matrix			
	X	X		X				LinearSystemId_IdentifyDriveTrainSystem.vi		Update to use create matrix			
	X	X		X				LinearSystemId_IdentifyPositionSystem.vi		Update to use create matrix			
	X	X		X				LinearSystemId_IdentifyVelocitySystem.vi		Update to use create matrix			

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE POSE ESTIMATOR	X	X		X				DiffDrivePoseEst_AddVisionMeasurement.vi					
	X	X		X				DiffDrivePoseEst_FillStateVector.vi					
	X	X		X				DiffDrivePoseEst_GetEstimatedPosition.vi					
	X	X		X				DiffDrivePoseEst_Kalman_F_Callback.vi					
	X	X		X				DiffDrivePoseEst_Kalman_H_Callback.vi					
	X	X		X				DiffDrivePoseEst_New.vi					
	X	X		X				DiffDrivePoseEst_ResetPosition.vi					

	X	X		X				DiffDrivePoseEst_SetVisionMeasurementStdDevs.vi					
	X	X		X				DiffDrivePoseEst_Update.vi					
	X	X		X				DiffDrivePoseEst_UpdateWithTime.vi					
	X	X		X				DiffDrivePoseEst_VisionCorrect_Callback.vi					
	X	X		X				DiffDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi					

	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes	*Code Review*	*Test Program*	*Error Checking*
EXTENDED KALMAN FILTER	X	X		X				ExtendedKalmanFilter_Correct_OnlyUY.vi					
	X	X		X				ExtendedKalmanFilter_Correct.vi		Just a shell, not functional!			
	X	X		X				ExtendedKalmanFilter_GetP_Single.vi					
	X	X		X				ExtendedKalmanFilter_GetP.vi					
	X	X		X				ExtendedKalmanFilter_GetXHat_Single.vi					
	X	X		X				ExtendedKalmanFilter_GetXHat.vi					
	X	X		X				ExtendedKalmanFilter_New.vi					
	X	X		X				ExtendedKalmanFilter_Predict.vi					
	X	X		X				ExtendedKalmanFilter_Reset.vi					
	X	X		X				ExtendedKalmanFilter_SetP.vi					
	X	X		X				ExtendedKalmanFilter_SetXHat_Single.vi					
	X	X		X				ExtendedKalmanFilter_SetXHat.vi					

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

	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes	*Code Review*	*Test Program*	*Error Checking*
KALMAN FILTER LATENCY COMPENSATOR	X	X		X				KalmanFilterLatencyComp_AddObserverState.vi					
	X	X		X				KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi					
	X	X		X				KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.vi					
	X	X		X				KalmanFilterLatencyComp_FindClosestMeasurement.vi					
	X	X		X				KalmanFilterLatencyComp_New.vi					
	X	X		X				KalmanFIlterLatencyComp_Observer_New.vi					
	X	X		X				KalmanFilterLatencyComp_Reset.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
SWERVE DRIVE POSE ESTIMATOR								SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi					
	X	X		X				SwerveDrivePoseEst_AddVisionMeasurement.vi					
	X	X		X				SwerveDrivePoseEst_GetEstimatedPosition.vi					
	X	X		X				SwerveDrivePoseEst_Kalman_F_Callback.vi					
	X	X		X				SwerveDrivePoseEst_Kalman_H_Callback.vi					
	X	X		X				SwerveDrivePoseEst_New.vi					
	X	X		X				SwerveDrivePoseEst_ResetPosition.vi					
	X	X		X				SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi					
	X	X		X				SwerveDrivePoseEst_Update.vi					
	X	X		X				SwerveDrivePoseEst_UpdateWithTime.vi					
	X	X		X				SwerveDrivePoseEst_VisionCorrect_Callback.vi					
	X	X		X				SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi					

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

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
CONTROL AFFINE PLANT INVERSION FEEDFORWARD													

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
LINEAR PLANT INVERSION FEEDFORWARD	X	X		X				LinearPlntInvFF_Calculate_NextR.vi					
	X	X		X				LinearPlntInvFF_Calculate.vi					
	X	X		X				LinearPlntInvFF_GetR_Single.vi					
	X	X		X				LinearPlntInvFF_GetR.vi					
	X	X		X				LinearPlntInvFF_GetUff_Single.vi					
	X	X		X				LinearPlntInvFF_GetUff.vi					
	X	X		X				LinearPlntInvFF_New_Plant.vi					
	X	X		X				LinearPlntInvFF_New.vi					
	X	X		X				LinearPlntInvFF_Reset_Initial.vi					
	X	X		X				LinearPlntInvFF_Reset_Zero.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 QUADRATIC REGULATOR	X	X		X				LinearQuadraticRegulator_Calculate_NextR.vi					
	X	X		X				LinearQuadraticRegulator_Calculate.vi					
	X	X		X				LinearQuadraticRegulator_GetK_Single.vi		NOT ORIGINAL…			
	X	X		X		X		LinearQuadraticRegulator_GetK.vi					
	X	X		X				LinearQuadraticRegulator_GetR_Single.vi					
	X	X		X				LinearQuadraticRegulator_GetR.vi					
	X	X		X				LinearQuadraticRegulator_GetU_Single.vi					
	X	X		X				LinearQuadraticRegulator_GetU.vi					
	/	X		X		X		LinearQuadraticRegulator_LatencyCompensate.vi		Routine exists, but it only has interger raise matrix to power.			
	X	X		X				LinearQuadraticRegulator_New_ELMS.vi					
	X	X						LinearQuadraticRegulator_New_N.vi					
								LinearQuadraticRegulator_New_Raw.vi					
	X	X		X		X		LinearQuadraticRegulator_New_SystemELMS.vi					
	X	X		X				LinearQuadraticRegulator_New.vi					
	X	X		X				LinearQuadraticRegulator_Reset.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	X	X		X	I			LinearSystem_CalculateX.vi					
	X	X		X	I			LinearSystem_CalculateY.vi					
	X	X		X	SI			LinearSystem_GetA.vi					
	X	X		X	SI			LinearSystem_GetAElement.vi					
	X	X		X	SI			LinearSystem_GetB.vi					
	X	X		X	SI			LinearSystem_GetBElement.vi					
	X	X		X	SI			LinearSystem_GetC.vi					
	X	X		X	SI			LinearSystem_GetCElement.vi					
	X	X		X	SI			LinearSystem_GetD.vi					
	X	X		X	SI			LinearSystem_GetDElement.vi					
	X	X		X	SI			LinearSystem_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 LOOP	X	X		X				LinearSystemLoop_ClampInput.vi					
	X	X		X				LinearSystemLoop_Correct.vi					
								LinearSystemLoop_GetClampFunction.vi					
	X	X		X				LinearSystemLoop_GetController.vi					
	X	X		X				LinearSystemLoop_GetError_Single.vi					
	X	X		X				LinearSystemLoop_GetError.vi					
	X	X		X				LinearSystemLoop_GetFeedForward.vi					
	X	X		X				LinearSystemLoop_GetNextR_Single.vi					
	X	X		X				LinearSystemLoop_GetNextR.vi					
	X	X		X				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					
	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
'============

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
CALLBACK HELPER	X	X	X	X				CallbackHelp_MatrixMinus.vi					
	X	X	X	X				CallbackHelp_MatrixMult_CoerceSizeB.vi					
	X	X	X	X				CallbackHelp_MatrixMult.vi					
	X	X	X	X				CallbackHelp_MatrixPlus.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
DISCRETIZATION	X	X		X		X		Discretization_DiscretizeA.vi					
	X	X		X		X		Discretization_DiscretizeAB.vi					
	X	X		X		X		Discretization_DiscretizeABTaylor.vi					
	X	X		X		X		Discretization_DiscretizeAQ.vi					
	X	X		X		X		Discretization_DiscretizeAQTaylor.vi					
	X	X		X				Discretization_DiscretizeR.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
STATE SPACE UTIL	X	X	X	No				StateSpaceUtil_Check_Stabalizable.vi		Internal routine			
	X	X		X				StateSpaceUtil_ClampInputMaxMagnitude.vi		Routine exists, it is just a shell			
	X	X		X				StateSpaceUtil_IsDetectable.vi					
	X	X		X				StateSpaceUtil_IsStabalizable.vi					
	X	X		X		X		StateSpaceUtil_MakeCostMatrix.vi					
	X	X		X		X		StateSpaceUtil_MakeCovarianceMatrix.vi					
	X	X		X				StateSpaceUtil_MakeWhiteNoiseVector.vi					
	X	X		X				StateSpaceUtil_NomalizeInputVector.vi					
	X	X		X				StateSpaceUtil_PoseTo3dVector.vi					
	X	X		X				StateSpaceUtil_PoseTo4dVector.vi					
	X	X		X				StateSpaceUtil_PoseToVector.vi					

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
BATTERY SIM	X	X		X	SI			BatterySim_CalculateDefaultBatteryLoadedVoltage.vi					
	X	X		X	SI			BatterySim_CalculateLoadedVoltage.vi					

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

	X	X		X				DiffDriveTrainSim_SetPose.vi					
	X	X		X				DiffDriveTrainSim_SetState.vi					
	X	X		X				DiffDriveTrainSim_ToughBoxMiniGearRatio.vi					
	X	X		X				DiffDriveTrainSim_ToughBoxMiniMotor.vi					
	X	X		X				DiffDriveTrainSim_Update.vi					

	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes	*Code Review*	*Test Program*	*Error Checking*
ELEVATOR SIM	X	X		X				ElevatorSim_GetCurrentDraw.vi					
	X	X		X				ElevatorSim_GetPositionMeters.vi					
	X	X		X				ElevatorSim_GetVelocityMetersPerSecond.vi					
	X	X		X				ElevatorSim_HasHitLowerLimit.vi					
	X	X		X				ElevatorSim_HasHitUpperLimit.vi					
								ElevatorSim_New_LinSys_NoNoise.vi					
								ElevatorSim_New_LinSys.vi					
								ElevatorSim_New_NoNoise.vi					
	X	X		X				ElevatorSim_New.vi					
	X	X	X	*No*				ElevatorSim_RKF45_Func.vi					
	X	X		X				ElevatorSim_SetInputVoltage.vi					
	X	X		X				ElevatorSim_SetState.vi					
	X	X	X	X				ElevatorSim_Update.vi		Needed because this doesn't extend.			
	X	X		X				ElevatorSim_UpdateX.vi					
	X	X		X				ElevatorSim_WouldHitLowerLimit.vi					
	X	X		X				ElevatorSim_WouldHitUpperLimit.vi					

	Implemented	*Documented*	*Not WPILIB*	*Menu Item*	*Execution Optimized*	*Test Routine*	*Sample Program*	VI Name	Function Prototype	Notes	*Code Review*	*Test Program*	*Error Checking*
FLYWHEEL SIM	X	X		X				FlyWheelSim_GetAngularVelocityRadPerSec.vi					
	X	X		X				FlyWheelSim_GetAngularVelocityRPM.vi					
	X	X		X				FlyWheelSim_GetCurrentDrawAmps					
								FlyWheelSim_New_LinSys		Future			
								FlyWheelSim_New_LinSys_MOI_NoNoise		Future			
								FlyWheelSim_New_LinSys_NoNoise		Future			
	X	X		X				FlyWheelSim_New_MOI.vi					
	X	X		X				FlyWheelSim_SetInput.vi					
	X	X		X				FlyWheelSim_SetState.vi					
	X	X		X				FlyWheelSim_Update.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 SIM	X	X		X				LinearSystemSim_ClampInput.vi					
								LinearSystemSim_GetCurrentDrawAmps.vi		DONT IMPLEMENT…			
	X	X		X				LinearSystemSim_GetOutput_Single.vi					
	X	X		X				LinearSystemSim_GetOutput.vi					
	X	X		X				LinearSystemSim_New					
								LinearSystemSim_New_NoNoise.vi					
	X	X		X				LinearSystemSim_SetInput_Array.vi		Doesn't use clamp ?			

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
	X	X		X				LinearSystemSim_SetInput_Single.vi					
	X	X		X				LinearSystemSim_SetInput.vi					
	X	X		X				LinearSystemSim_Setstate.vi					
	X	X		X				LinearSystemSim_Update.vi					
	X	X		No				LinearSystemSim_UpdateX.vi					
	X	X	X	No				LinearSystemSim_UpdateY.vi					

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

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

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
MAT BUILDER	X	X		X	SI			MatBuilder_Create.vi					
	X	X		X	SI			MatBuilder_Fill.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATRIX	X	X		X	SI			Matrix_AssignBlock.vi					
	X	X		X	SI			Matrix_Block.vi					
								Matrix_ChangeBoundsUnchecked.vi					
	X	X		X	SI			Matrix_Create.vi					
								Matrix_Det.vi					
	X	X		X	SI			Matrix_Diag.vi					
								Matrix_Div_Scalar.vi		labview has function			
								Matrix_ElementPower.vi					
	X	X		X	SI			Matrix_ElementSum.vi					
								Matrix_ElementTimes.vi					
								Matrix_Equals.vi					
	X	X		X	I			Matrix_Exp.vi					
	X	X		X	SI			Matrix_ExtractColumnVector.vi					

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
X	X		X	SI			Matrix_ExtractFrom.vi					
							Matrix_ExtractMatrix.vi					
X	X		X	SI			Matrix_ExtractRowVector.vi					
X	X		X	SI			Matrix_Fill.vi					
							Matrix_Get.vi		labview has function			
X	X		X	I			Matrix_Ident.vi		WPILIB calls this EYE			
							Matrix_Inv.vi					
X	X		X	SI			Matrix_IsEqual.vi					
							Matrix_IsIdentical.vi					
X	X		X	I			Matrix_LLTDecompose.vi					
							Matrix_Max.vi					
							Matrix_MaxAbs.vi					
							Matrix_Mean.vi					
							Matrix_MinInternal.vi					
							Matrix_Minus_Matrix.vi					
							Matrix_Minus_Scalar.vi					
X	X		X	I			Matrix_NormF.vi					
							Matrix_NormIndP1.vi					
							Matrix_Plus_Matrix.vi					
							Matrix_Plus_Scalar.vi					
X	X		X	I			Matrix_Pow.vi		THIS NEEDS WORK!!!!			
X	X		X	SI			Matrix_SetColumn.vi					
X	X		X	SI			Matrix_SetRow.vi	THERE ARE LOTS OF OTHER MATRIX FUNCTIONS THAT SHOULD BE INCLUDED HERE FOR ISOLATION.				
							Matrix_Solve.vi					
							Matrix_Times_Matrix.vi					
							Matrix_Times_Scalar.vi					
							Matrix_Trace.vi					
X	X		X	SI			Matrix_Transpose.vi					

SIMPLE MATRIX

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
X	X		X	SI			SimpleMatrix_ExtractMatrix.vi		NOTE Matrix also has an ExtractMatrix with different calling parameters…. YUK.			

MATRIX HELPER

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

VECTOR BUILDER

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
X	X		X	SI			VecBuilder_1x1Fill.vi					
X	X		X	SI			VecBuilder_2x1Fill.vi					

X	X		X	SI			VecBuilder_3x1Fill.vi					
X	X		X	SI			VecBuilder_4x1Fill.vi					
X	X		X	SI			VecBuilder_5x1Fill.vi					
X	X		X	SI			VecBuilder_6x1Fill.vi					
X	X		X	SI			VecBuilder_7x1Fill.vi					
X	X		X	SI			VecBuilder_8x1Fill.vi					
							VecBuilder_9x1Fill.vi					
							VecBuilder_10x1Fill.vi					
X	X	X	X	SI			VecBuilder_ArrayBy1Fill.vi					

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MATH
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ANGLE STATISTICS

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
X	X	X	X	X			AngleStats_AngleAdd_CallbackHelp.vi					
X	X		X	I	X		AngleStats_AngleAdd.vi					
X	X	X	X	X			AngleStats_AngleMean_CallbackHelp.vi					
X	X		X	I	X		AngleStats_AngleMean.vi					
X	X	X	X	X			AngleStats_AngleResidual_CallbackHelp.vi					
X	X		X	I	X		AngleStats_AngleResidual.vi					

MATH UTILITY

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
X	X		X	SI			MathUtil_AngleModulus.vi					
X	X		X	SI			MathUtil_ApplyDeadband.vi					
X	X		X	SI			MathUtil_Clamp_Int.vi					
X	X		X	SI			MathUtil_Clamp.vi					
X	X		X	SI			MathUtil_InputModulus.vi					

MERWE SCALED SIGMA POINTS

Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
X	X		X	I			MerweScSigPts_ComputeWeights.vi					
X	X		X	SI			MerweScSigPts_GetNumSigmas.vi					
X	X		X	SI			MerweScSigPts_GetWc_Single.vi					
X	X		X	SI			MerweScSigPts_GetWc.vi					
X	X		X	SI			MerweScSigPts_GetWm_Single.vi					
X	X		X	SI			MerweScSigPts_GetWm.vi					
X	X		X	I			MerweScSigPts_New_Default.vi					
X	X		X	I			MerweScSigPts_New.vi					
X	X		X	I			MerweScSigPts_SigmaPoints.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
NUMERICAL INTEGRATION	X	X		X	I			NumIntegrate_Func_Ax_Bu_K.vi		NOT USED. Should this be used or abandoned???			
	X	X		X				NumIntegrate_Rk4_Dbl_X_U.vi					
	X	X		X				NumIntegrate_Rk4_Dbl_X.vi					
	X	X		X				NumIntegrate_Rk4_Mat_X_U.vi					
	X	X		X				NumIntegrate_Rk4_Mat_X.vi					
	/							NumIntegrate_RKDP_Mat_X_U.vi		New replacement for RKF45			
	X	X		No	SI			NumIntegrate_RKf45_Func_Bs.vi					
	X	X		No	SI			NumIntegrate_RKf45_Func_Ch.vi					
	X	X		No	SI			NumIntegrate_RKf45_Func_Ct.vi					
	X	X		No	I			NumIntegrate_Rkf45_Impl.vi					
	X	X		X				NumIntegrate_Rkf45_Mat_X_U.vi		Note that this Feinberg method has been changed and a Dormand Price method has been implemented…. TODO			
	/							NumIntegrate_RKf45_New.vi		New for using new refactored values. Work In Progress…			
	X	X	X	X	SI			NumIntegrate_Trap_Dbl.vi					
	X	X	X	X	I			NumIntegrate_Trap_Mat.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
RUNGE KUTTA TIME VARYING	X	X		No				RungeKuttaTimeVarying_RK4_Mat_T_Y.vi					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
NUMERICAL JACOBIAN	X	X		X				NumJacobian_U.vi					
	X	X		X				NumJacobian_X.vi					

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

Revision 2.X 12/07/2021 – Added Bang/Bang – (not very useful)

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TYPE DEFINITIONS
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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
TypeDef	Z	X	X	X	N/A			ARM_FF.CTL		
	Z	X	X	X	N/A			BANG_BANG.CTL		
	\		X	X	N/A			BICon-Matrix_FUNC_TYPE.CTL		NOT USED. Should this be deleted or abandoned???
	Z	X	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	X	N/A			DCMOTOR_TYPES_ENUM.CTL		
	Z	X	X	X	N/A			DCMOTOR.CTL		
	Z	X	X	X	N/A			DIFF_DRIVE_KINEMATICS.CTL		
	Z	X	X	X	N/A			DIFF_DRIVE_Kitbot_WheelSize_ENUM.ctl		
	Z	X	X	X	N/A			DiFF_DRIVE_POSE_EST.ctl		
	Z	X	X	X	N/A			DIFF_DRIVE_ToughBoxMini_GearChoice_ENUM.ctl		
	Z	X	X	X	N/A			DIFF_DRIVE_ToughBoxMini_MotorChoice_ENUM.ctl		
	Z	X		X	N/A			DIFF_DRIVE_TRAIN_SIM_STATE_ENUM.CTL		
	Z	X	X	X	N/A			DIFF_DRIVE_TRAIN_SIM.ctl		
	Z	X	X	X	NA			DISPLAY_WAYPOINT.ctl		Was UTIL_WAYPOINT.VI
	Z	X	X	X	NA			DISPLAY_WEIGHTED_WAYPOINT.ctl		New V1.5. was UTIL_WEIGHTED_WAYPOINIT.VI
	Z	X	X	X	N/A			ELEV_FF.CTL		
	Z	X	X	X	N/A			ELEVATOR_SIM.CTL		
	Z	X	X	X	N/A			EXTENDED_KALMAN_CORRECT_FUNC_GROUP.CTL		
	Z		X	X	N/A			ExTENDED_KALMAN_FILTER.CTL		
	Z	X	X	X	N/A			FLYWHEEL_SIM.ctl		
	Z	X	X	X	N/A			HOLONOMIC_DRV_CTRL.CTL		New 1/26/21
	Z	X	X	X	N/A			KALMAN_FILTER_LATENCY_COMP_FUNC_GROUP.CTL		
	Z	X	X	X	N/A			KALMAN_FILTER_LATENCY_COMP.CTL		
	Z	X	X	X	N/A			KALMAN_FILTER.ctl		
	Z	X	X	X	N/A			LINEAR_FILTER.CTL		
	Z	X	X	X	N/A			LINEAR_PLANT_INV_FF.ctl		
	Z	X	X	X	N/A			LINEAR_QUADRATIC_REGULATOR.ctl		
	Z	X	X	X	N/A			LINEAR_SYSTEM_LOOP.ctl		
	Z	X	X	X	N/A			LINEAR_SYSTEM_SIM.ctl		
	Z	X	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	X	N/A			MEDIAN_FILTER.CTL		
	Z	X	X	X	N/A			MERWE_SCALED_SIGMA_PTS.ctl		
	Z	X	X	X	N/A			OBSERVER_SNAP_LIST_ITEM.CTL		
	Z	X	X	X	N/A			OBSERVER_SNAPSHOT.CTL		
	Z	X	X	X	N/A			PARAM_STACK_ITEM.CTL		
	Z	X	X	X	N/A			PARAM_STACK.CTL		
	Z	X	X	X	N/A			PID_ADV_LIMITS.CTL		
	Z	X	X	X	N/A			PID_ADV_TUNING.CTL		
	Z	X	X	X	N/A			PID_CONTROLLER.CTL		
	Z	X	X	X	N/A			PID_ERROR_TOLERANCE.CTL		
	Z	X	X	X	N/A			PID_INPUT_LIMITS.CTL		
	Z	X	X	X	N/A			PID_TUNING.CTL		
	Z	X	X	X	N/A			POSE2D.CTL		
	Z	X	X	X	N/A			POSEwCURVATURE.CTL		
	Z	X	X	X	N/A			PROFILED_PID_CONTROLLER.CTL		
	Z	X	X	X	N/A			RAMSETE_EXE_TUNING.CTL		
	Z	X	X	X	N/A			RAMSETE.CTL		
	Z	X	X	X	N/A			ROTATION2D.CTL		

Z	X	X	X	N/A			SIMPLE_MOTOR_FF.CTL		
Z	X	X	X	N/A			SINGLE_JOINT_ARM_SIM.CTL		
Z	X	X	X	N/A			SLEW_RATE_LIMITER.CTL		
Z	X	X	X	N/A			SPLINE_CTRL_VECTOR.CTL		
Z	X	X	X	N/A			SPLINE.CTL		
Z	X	X	X	N/A			SWERVE_DRIVE_KINEMATICS.CTL		
Z	X	X	X	N/A			SWERVE_DRIVE_MODULE_STATE.CTL		
Z	X	X	X	N/A			SWERVE_DRIVE_ODOMETRY.CTL		
Z	X		X	N/A			SWERVE_DRIVE_POSE_EST.CTL		
Z	X	X	X	N/A			TIMER.CTL		
Z	X	X	X	N/A			TRAJ_CONFIG.CTL		
Z	X	X	X	N/A			TRAJ_CONSTRAINT_CENTRIPETAL_ACCEL.CTL		
Z	X	X	X	N/A			TRAJ_CONSTRAINT_DIIF_DRIVE_KINEMATICS.CTL		
Z	X	X	X	N/A			TRAJ_CONSTRAINT_DIIF_DRIVE_VOLTAGE.CTL		
\		X		N/A			TRAJ_CONSTRAINT_JERK.CTL		Routine exists, it is just a shell
Z	X	X	X	N/A			TRAJ_CONSTRAINT_MECA_DRIVE_KINEMATICS.CTL		
Z	X	X	X	N/A			TRAJ_CONSTRAINT_MINMAX.CTL		
Z	X	X	X	N/A			TRAJ_CONSTRAINT_SWERVE_DRIVE_KINEMATICS.CTL		
Z	X	X	X	N/A			TRAJ_STATE.CTL		
Z	X	X	X	N/A			TRAJECTORY_SPLINE_TYPE_ENUM.CTL		
Z	X	X	X	N/A			TRAJECTORY.CTL		
Z	X	X	X	N/A			TRANSFORM2D.CTL		
Z	X	X	X	N/A			TRANSLATION2D.CTL		
Z	X	X	X	N/A			TRAPEZOID_PROFILE_CONSTRAINT.CTL		
Z	X	X	X	N/A			TRAPEZOID_PROFILE_STATE.CTL		
Z	X	X	X	N/A			TRAPEZOID_PROFILE.CTL		
Z	X	X	X	N/A			TWIST2D.CTL		
Z	X	X	X	N/A			UNSCENTED_KALMAN_CORRECT_FUNC_GROUP.CTL		
Z	X	X	X	N/A			UNSCENTED_KALMAN_FILTER.ctl		
Z	X	X	X	N/A			UNSCENTED_KALMAN_NEW_FUNC_GROUP.CTL		
Z	X	X	X	N/A			UTIL_PATHFINDER_CONFIG.CTL		
N/A		N/A		N/A			WAYPOINTS.CTL		Delete – obsolete
Z	X	X	X	NA			WEIGHTED_WAYPOINT.CTL		New V1.5
N/A		N/A		N/A			X_Y_HEADINGS.CTL		Delete – obsolete