

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	797	766	242	758	422	26	12	Doc completed Pct
VI Total (X)	714							96.11%
CTL Total (Z)	83							Optimization Pct
VI Shell Total (I)	9							52.95%
CTRL Shell Total (I)	2							
								Optimize legend: S = Subroutine, I = Inline, X = reviewed, nothing done. (In some cases, after sufficient debug and use, additional optimizations could be considered.)

'=====

BASE

'=====

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
LINEAR FILTER	X	X		X	S/I			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		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	S/I			LinearFilter_Reset.vi		
	X	X	X	X	S/I			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	S/I			MedianFilter_New.vi		
	X	X		X	S/I			MedianFilter_Reset.vi		
	X	X	X	X	S/I			MedianFilter_ResetToValue.vi		

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

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

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

=====

CONTROLLER

=====

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

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

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

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

HOL_DRV_CTRL	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
	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			HoIDrvCtrl_New.vi		Added 1/26/21
X	X		X	SI			HoIDrvCtrl_SetEnabled.vi		Added 1/26/21
X	X		X	SI			HoIDrvCtrl_SetTolerance.vi		Added 1/26/21

PID CONTROLLER	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
	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_DisableContinuousInput.vi		
	X	X		X	SI			PIDController_EnableContinuousInput.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		

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

'=====

GEOMETRY

'=====

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

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

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

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

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

=====

KINEMATICS

=====

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

DIFFERENTIAL DRIVE KINEMATICS	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
	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		
	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	/			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	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
nothing done										

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	X			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)	
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)
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)

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

=====

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

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

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

=====

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

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

TRAJECTORY CONFIG	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
	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 CONSTRAINTS HERE, SINCE NEW CONSTRAINTS ARE SPECIFIC AND NOT GENERIC.										

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

TRAJECTORY GENERATE (Control Vector)	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
									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

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

TRAJECTORY PARAMETERIZE CONSTRAINED STATE	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
	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()	

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

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

'=====

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

DIFF DRIVE KINEMATIC CONSTRAINT	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
	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)	

DIFF DRIVE VOLTAGE CONSTRAINT	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
	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)	

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

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

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		

FRC LabVIEW Trajectory Library – VI Implementation List

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

X	X	X	X				Util_WeightedWaypion _t _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					

EXTENDED KALMAN FILTER	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				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					

KALMAN FILTER	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		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					

KALMAN FILTER LATENCY COMPENSATOR	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				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	X	X		X				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													

								VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program						
LINEAR PLANT INVERSION FEEDFORWARD	X	X		X				LinearPIntInvFF_Calculate_NextR.vi					
	X	X		X				LinearPIntInvFF_Calculate.vi					
	X	X		X				LinearPIntInvFF_GetR_Single.vi					
	X	X		X				LinearPIntInvFF_GetR.vi					
	X	X		X				LinearPIntInvFF_GetUff_Single.vi					
	X	X		X				LinearPIntInvFF_GetUff.vi					
	X	X		X				LinearPIntInvFF_New_Plant.vi					
	X	X		X				LinearPIntInvFF_New.vi					
	X	X		X				LinearPIntInvFF_Reset_Initial.vi					
	X	X		X				LinearPIntInvFF_Reset_Zero.vi					
								VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program						
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					
								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					
								VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program						
LINEAR SYSTEM	X	X		X	/			LinearSystem_CalculateX.vi					
	X	X		X	/			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		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				StateSpaceUtil_ClampInputMaxMagnitude.vi		Routine exists, it is just a shell			
	/	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 ?			
	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					

SINGLE JOINT ARM SIM	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				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

=====

MAT 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			MatBuilder_Create.vi					
	X	X		X	SI			MatBuilder_Fill.vi					

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			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					
	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			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					

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

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

=====

MATH

=====

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
ANGLE STATISTICS	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					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATH UTILITY	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					

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
MERWE SCALED SIGMA POINTS	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		No	/			NumIntegrate_Func_Ax_Bu_K.vi		NOT USED. Should this be used or abandoned???			
	X							NumIntegrate_Rk4_Dbl_X_U.vi					
	X							NumIntegrate_Rk4_Dbl_X.vi					
	X	X		X				NumIntegrate_Rk4_Mat_X_U.vi					
	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	/			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	/			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			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				Riccati_Check_Detectable.vi		Routine exists, it is just a shell			
	/			X				Riccati_Check_Stabilizable.vi		Not really done !!!			
	X			X		X		Riccati_DARE_Iterate.vi					
	X	X		X				Riccati_DARE_N.vi					
	X	X		X		X		Riccati_DARE.vi					
	X			X				Riccati_Input_Check.vi					

TYPE DEFINITIONS

TypeDef	Implemented	Documented	Not WPLIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	Function Prototype	Notes
	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		
	Z		X	X	N/A			CALLBACK_FUNC_TYPE.CTL		
	Z	X	X	X	N/A			CHASSIS_SPEEDS.CTL		
	Z	X	X	X	N/A			CONSTRAINED_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.ctf		
	Z	X	X	X	N/A			DIFF_DRIVE_POSE_EST.ctf		
	Z	X	X	X	N/A			DIFF_DRIVE_ToughBoxMini_GearChoice_ENUM.ctf		
	Z	X	X	X	N/A			DIFF_DRIVE_ToughBoxMini_MotorChoice_ENUM.ctf		
	Z	X		X	N/A			DIFF_DRIVE_TRAIN_SIM_STATE_ENUM.CTL		
	Z	X	X	X	N/A			DIFF_DRIVE_TRAIN_SIM.ctf		
	Z	X	X	X	NA			DISPLAY_WAYPOINT.ctf		Was UTIL_WAYPOINT.VI
	Z	X	X	X	NA			DISPLAY_WEIGHTED_WAYPOINT.ctf		New V1.5. was UTIL_WEIGHTED_WAYPOINT.VI
	Z	X	X	X	N/A			ELEV_FF.CTL		
	Z		X	X	N/A			ELEVATOR_SIM.CTL		
	Z		X	X	N/A			EXTENDED_KALMAN_CORRECT_FUNC_GROUP.CTL		
	Z		X	X	N/A			ExTENDED_KALMAN_FILTER.CTL		
	Z		X	X	N/A			FLYWHEEL_SIM.ctf		
	Z		X	X	N/A			HOLONOMIC_DRV_CTRL.CTL		New 1/26/21
	Z		X	X	N/A			KALMAN_FILTER_LATENCY_COMP_FUNC_GROUP.CTL		
	Z		X	X	N/A			KALMAN_FILTER_LATENCY_COMP.CTL		
	Z		X	X	N/A			KALMAN_FILTER.ctf		
	Z	X	X	X	N/A			LINEAR_FILTER.CTL		
	Z		X	X	N/A			LINEAR_PLANT_INV_FF.ctf		
	Z		X	X	N/A			LINEAR_QUADRATIC_REGULATOR.ctf		
	Z		X	X	N/A			LINEAR_SYSTEM_LOOP.ctf		
	Z		X	X	N/A			LINEAR_SYSTEM_SIM.ctf		
	Z		X	X	N/A			LINEAR_SYSTEM.ctf		
	Z	X	X	X	N/A			MECA_DRIVE_KINEMATICS.CTL		
	Z	X	X	X	N/A			MECA_DRIVE_ODOMETRY.CTL		
	Z	X	X	X	N/A			MECA_WHEEL_SPEEDS.CTL		
	Z		X	X	N/A			MEDIAN_FILTER.CTL		
	Z		X	X	N/A			MERWE_SCALED_SIGMA_PTS.ctf		
	Z		X	X	N/A			OBSERVER_SNAP_LIST_ITEM.CTL		
	Z		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	N/A			PID_ADV_LIMITS.CTL		
	Z		X	X	N/A			PID_ADV_TUNING.CTL		
	Z		X	X	N/A			PID_CONTROLLER.CTL		
	Z		X	X	N/A			PID_ERROR_TOLERANCE.CTL		
	Z		X	X	N/A			PID_INPUT_LIMITS.CTL		
	Z		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	N/A			PROFILED_PID_CONTROLLER.CTL		
	Z		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	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		
I		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.cti		
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	N/A		WEIGHTED_WAYPOINT.CTL		New V1.5
N/A		N/A		N/A		X_Y_HEADINGS.CTL		Delete – obsolete