Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines.

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...

Doc completed Pct 86.51% Optimization Pct 53.85%

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

'===== BASE

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FRC\_LabVIEW\_Trajectory\_Library\_Routines.xlsx

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2.X 5/2/2022 – added implicit model follower and tim										
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			X			$\perp$	ElevFF_Execute.vi		LabVIEW style single call			
			X		$\perp$	+	ElevFF_ExecuteVelocityOnly.vi		LabVIEW style single call			

ElevFF MaxAchieveAccel.vi

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		X	X			ElevFF_MinAchieveAccel.vi					
	X	X	X			ElevFF_MinAchieveVelocity.vi					
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	X	X	X	J		HolDrvCtrl_Calculate_Trajectory.vi		Added 1/26/21 Added 1/26/21			
	X	$\hat{X}$	X	1		HolDrvCtrl Calculate_vi		Added 1/26/21 Added 1/26/21			
	X		XX	•		HolDrvCtrl_Execute_Trajectory.vi		Added 1/20/21 Added 1/24/2022			
	X	X	X X			HolDrvCtrl Execute.vi		Future			
	X	X	X	SI		HolDrvCtrl New.vi		Added 1/26/21			
			X X	SI		HolDrvCtrl PackExecuteSP.vi					
		X	XX			HolDrvCtrl PackPID.vi		Added 1/24/2022			
	X	X	XX			HolDrvCtrl_PackProfPID.vi		Added 1/24/2022			
	X	X	X	SI		HolDrvCtrl_SetEnabled.vi		Added 1/26/21			
	X	X	X	SI		HolDrvCtrl_SetTolerance.vi		Added 1/26/21			
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PID CONTROLLER	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	SI SI SI SI SI SI SI		PIDController_AdvCalculate_FF_Sp_Pv_Per.vi PIDController_AdvCalculate_FF_Sp_Pv.vi  PIDController_AdvExecute.vi  PIDController_AtSetpoint.vi  PIDController_Calculate_PV.vi  PIDController_Calculate_Sp_Pv.vi  PIDController_DisableContinousInput.vi  PIDController_EnableContinousInput.vi  PIDController_Execute.vi  PIDController_Execute.vi  PIDController_GetContinuousError.vi  PIDController_GetPiD.vi  PIDController_GetPiD.vi  PIDController_GetSetpoint.vi  PIDController_GetSetpoint.vi  PIDController_GetVelocityError.vi  PIDController_GetVelocityError.vi  PIDController_IsContinuousInputEnabled.vi	Function Prototype	Advanced PID Advanced PID Labview style helper. Advanced PID  Labview style helper. Advanced Labview style helper	8	76	En
PID CONTROLLER	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	SI   SI   SI   SI   SI   SI   SI   SI		PIDController_AdvCalculate_FF_Sp_Pv_Per.vi PIDController_AdvCalculate_FF_Sp_Pv.vi  PIDController_AdvExecute.vi  PIDController_AtSetpoint.vi  PIDController_Calculate_PV.vi  PIDController_Calculate_Sp_Pv.vi  PIDController_DisableContinousInput.vi  PIDController_EnableContinousInput.vi  PIDController_Execute.vi  PIDController_GetContinuousError.vi  PIDController_GetPiD.vi  PIDController_GetPiD.vi  PIDController_GetSetpoint.vi  PIDController_GetSetpoint.vi  PIDController_GetVelocityError.vi  PIDController_GetVelocityError.vi  PIDController_IsContinuousInputEnabled.vi  PIDController_New.vi	Function Prototype	Advanced PID Advanced PID Labview style helper. Advanced PID  Labview style helper. Advanced Labview style helper	8	76	En
PID CONTROLLER	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	SI   SI   SI   SI   SI   SI   SI   SI		PIDController_AdvCalculate_FF_Sp_Pv_Per.vi PIDController_AdvCalculate_FF_Sp_Pv.vi  PIDController_AdvExecute.vi  PIDController_AtSetpoint.vi  PIDController_Calculate_PV.vi  PIDController_Calculate_Sp_Pv.vi  PIDController_DisableContinousInput.vi  PIDController_EnableContinousInput.vi  PIDController_Execute.vi  PIDController_Execute.vi  PIDController_GetContinuousError.vi  PIDController_GetPiD.vi  PIDController_GetPiD.vi  PIDController_GetSetpoint.vi  PIDController_GetSetpoint.vi  PIDController_GetVelocityError.vi  PIDController_IsContinuousInputEnabled.vi  PIDController_New.vi  PIDController_NewPeriod.vi	Function Prototype	Advanced PID Advanced PID Labview style helper. Advanced PID  Labview style helper. Advanced Labview style helper	8	76	En
PID CONTROLLER	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	SI   SI   SI   SI   SI   SI   SI   SI		PIDController_AdvCalculate_FF_Sp_Pv_Per.vi PIDController_AdvCalculate_FF_Sp_Pv.vi  PIDController_AdvExecute.vi  PIDController_AtSetpoint.vi  PIDController_Calculate_PV.vi  PIDController_Calculate_Sp_Pv.vi  PIDController_DisableContinousInput.vi  PIDController_EnableContinousInput.vi  PIDController_Execute.vi  PIDController_Execute.vi  PIDController_GetContinuousError.vi  PIDController_GetPiD.vi  PIDController_GetPiD.vi  PIDController_GetSetpoint.vi  PIDController_GetSetpoint.vi  PIDController_GetVelocityError.vi  PIDController_IsContinuousInputEnabled.vi  PIDController_New.vi  PIDController_NewPeriod.vi  PIDController_NewPeriod.vi  PIDController_Pack_AdvLimits.vi	Function Prototype	Advanced PID Advanced PID Labview style helper. Advanced PID  Labview style helper. Advanced Labview style helper	8	76	En
PID CONTROLLER	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	SI   SI   SI   SI   SI   SI   SI   SI		PIDController_AdvCalculate_FF_Sp_Pv_Per.vi PIDController_AdvCalculate_FF_Sp_Pv.vi  PIDController_AdvExecute.vi  PIDController_AtSetpoint.vi  PIDController_Calculate_PV.vi  PIDController_Calculate_Sp_Pv.vi  PIDController_DisableContinousInput.vi  PIDController_EnableContinousInput.vi  PIDController_Execute.vi  PIDController_Execute.vi  PIDController_GetContinuousError.vi  PIDController_GetPiD.vi  PIDController_GetPiD.vi  PIDController_GetSetpoint.vi  PIDController_GetSetpoint.vi  PIDController_GetVelocityError.vi  PIDController_IsContinuousInputEnabled.vi  PIDController_New.vi  PIDController_NewPeriod.vi  PIDController_Pack_AdvLimits.vi  PIDController_Pack_AdvTuning.vi	Function Prototype	Advanced PID Advanced PID Labview style helper. Advanced PID  Labview style helper. Advanced Labview style helper	8	Te	En
PID CONTROLLER	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	SI   SI   SI   SI   SI   SI   SI   SI		PIDController_AdvCalculate_FF_Sp_Pv_Per.vi PIDController_AdvCalculate_FF_Sp_Pv.vi  PIDController_AdvExecute.vi  PIDController_AtSetpoint.vi  PIDController_Calculate_PV.vi  PIDController_Calculate_Sp_Pv.vi  PIDController_DisableContinousInput.vi  PIDController_EnableContinousInput.vi  PIDController_Execute.vi  PIDController_GetContinuousError.vi  PIDController_GetPeriod.vi  PIDController_GetPiD.vi  PIDController_GetPiD.vi  PIDController_GetSetpoint.vi  PIDController_GetSetpoint.vi  PIDController_IsContinuousInputEnabled.vi  PIDController_New.vi  PIDController_New.vi  PIDController_Pack_AdvLimits.vi  PIDController_Pack_AdvTuning.vi  PIDController_Pack_ErrorTolerance.vi	Function Prototype	Advanced PID Advanced PID Labview style helper. Advanced PID  Labview style helper. Advanced Labview style helper	8	7 Te	En
PID CONTROLLER	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	SI   SI   SI   SI   SI   SI   SI   SI		PIDController_AdvCalculate_FF_Sp_Pv_Per.vi PIDController_AdvCalculate_FF_Sp_Pv.vi  PIDController_AdvExecute.vi  PIDController_AtSetpoint.vi  PIDController_Calculate_PV.vi  PIDController_Calculate_Sp_Pv.vi  PIDController_DisableContinousInput.vi  PIDController_EnableContinousInput.vi  PIDController_Execute.vi  PIDController_GetContinuousError.vi  PIDController_GetPriod.vi  PIDController_GetPlD.vi  PIDController_GetPositionError.vi  PIDController_GetSetpoint.vi  PIDController_GetVelocityError.vi  PIDController_IsContinuousInputEnabled.vi  PIDController_New.vi  PIDController_New.vi  PIDController_Pack_AdvLimits.vi  PIDController_Pack_ErrorTolerance.vi  PIDController_Pack_InputLimits.vi	Function Prototype	Advanced PID Advanced PID Labview style helper. Advanced PID  Labview style helper. Advanced Labview style helper	8	7	En
PID CONTROLLER	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	SI   SI   SI   SI   SI   SI   SI   SI		PIDController_AdvCalculate_FF_Sp_Pv_Per.vi PIDController_AdvCalculate_FF_Sp_Pv.vi  PIDController_AdvExecute.vi  PIDController_AtSetpoint.vi  PIDController_Calculate_PV.vi  PIDController_Calculate_Sp_Pv.vi  PIDController_DisableContinousInput.vi  PIDController_EnableContinousInput.vi  PIDController_Execute.vi  PIDController_GetContinuousError.vi  PIDController_GetPeriod.vi  PIDController_GetPiD.vi  PIDController_GetPiD.vi  PIDController_GetSetpoint.vi  PIDController_GetSetpoint.vi  PIDController_IsContinuousInputEnabled.vi  PIDController_New.vi  PIDController_New.vi  PIDController_Pack_AdvLimits.vi  PIDController_Pack_AdvTuning.vi  PIDController_Pack_ErrorTolerance.vi	Function Prototype	Advanced PID Advanced PID Labview style helper. Advanced PID  Labview style helper. Advanced Labview style helper	8	7	En
PID CONTROLLER	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	SI   SI   SI   SI   SI   SI   SI   SI		PIDController_AdvCalculate_FF_Sp_Pv_Per.vi PIDController_AdvCalculate_FF_Sp_Pv.vi  PIDController_AdvExecute.vi  PIDController_AtSetpoint.vi  PIDController_Calculate_PV.vi  PIDController_Calculate_Sp_Pv.vi  PIDController_DisableContinousInput.vi  PIDController_EnableContinousInput.vi  PIDController_Execute.vi  PIDController_GetContinuousError.vi  PIDController_GetPiD.vi  PIDController_GetPiD.vi  PIDController_GetPositionError.vi  PIDController_GetSetpoint.vi  PIDController_GetVelocityError.vi  PIDController_IsContinuousInputEnabled.vi  PIDController_New.vi  PIDController_New.vi  PIDController_NewPeriod.vi  PIDController_Pack_AdvLimits.vi  PIDController_Pack_ErrorTolerance.vi  PIDController_Pack_InputLimits.vi  PIDController_Pack_Tuning.vi	Function Prototype	Advanced PID Advanced PID Labview style helper. Advanced PID  Labview style helper. Advanced Labview style helper	8	7	En
PID CONTROLLER	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	SI   SI   SI   SI   SI   SI   SI   SI		PIDController_AdvCalculate_FF_Sp_Pv_Per.vi PIDController_AdvCalculate_FF_Sp_Pv.vi  PIDController_AdvExecute.vi  PIDController_AtSetpoint.vi  PIDController_Calculate_PV.vi  PIDController_Calculate_Sp_Pv.vi  PIDController_DisableContinousInput.vi  PIDController_EnableContinousInput.vi  PIDController_EnableContinousError.vi  PIDController_GetContinuousError.vi  PIDController_GetPiD.vi  PIDController_GetPiD.vi  PIDController_GetSetpoint.vi  PIDController_GetSetpoint.vi  PIDController_GetVelocityError.vi  PIDController_IsContinuousInputEnabled.vi  PIDController_New.vi  PIDController_NewPeriod.vi  PIDController_Pack_AdvLimits.vi  PIDController_Pack_AdvTuning.vi  PIDController_Pack_InputLimits.vi  PIDController_Pack_InputLimits.vi  PIDController_Reset.vi  PIDController_SetD.vi  PIDController_SetD.vi  PIDController_SetDerivativeFilter.vi	Function Prototype	Advanced PID Advanced PID Labview style helper. Advanced PID  Labview style helper OBSOLETE – Removed  Advanced PID	8	7	En
PID CONTROLLER	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	SI   SI   SI   SI   SI   SI   SI   SI		PIDController_AdvCalculate_FF_Sp_Pv_Per.vi PIDController_AdvCalculate_FF_Sp_Pv.vi  PIDController_AdvExecute.vi  PIDController_AtSetpoint.vi  PIDController_Calculate_PV.vi  PIDController_Calculate_Sp_Pv.vi  PIDController_DisableContinousInput.vi  PIDController_EnableContinousInput.vi  PIDController_Execute.vi  PIDController_GetContinuousError.vi  PIDController_GetPiD.vi  PIDController_GetPiD.vi  PIDController_GetPositionError.vi  PIDController_GetSetpoint.vi  PIDController_GetVelocityError.vi  PIDController_IsContinuousInputEnabled.vi  PIDController_New.vi  PIDController_New.vi  PIDController_Pack_AdvLimits.vi  PIDController_Pack_AdvTuning.vi  PIDController_Pack_InputLimits.vi  PIDController_Pack_Tuning.vi  PIDController_Reset.vi  PIDController_Reset.vi  PIDController_SetD.vi	Function Prototype	Advanced PID Advanced PID Labview style helper. Advanced PID  Labview style helper OBSOLETE – Removed	8	7	En
PID CONTROLLER	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	SI   SI   SI   SI   SI   SI   SI   SI		PIDController_AdvCalculate_FF_Sp_Pv_Per.vi PIDController_AdvCalculate_FF_Sp_Pv.vi  PIDController_AdvExecute.vi  PIDController_AtSetpoint.vi  PIDController_Calculate_PV.vi  PIDController_Calculate_Sp_Pv.vi  PIDController_DisableContinousInput.vi  PIDController_EnableContinousInput.vi  PIDController_EnableContinousError.vi  PIDController_GetContinuousError.vi  PIDController_GetPiD.vi  PIDController_GetPiD.vi  PIDController_GetSetpoint.vi  PIDController_GetSetpoint.vi  PIDController_GetVelocityError.vi  PIDController_IsContinuousInputEnabled.vi  PIDController_New.vi  PIDController_NewPeriod.vi  PIDController_Pack_AdvLimits.vi  PIDController_Pack_AdvTuning.vi  PIDController_Pack_InputLimits.vi  PIDController_Pack_InputLimits.vi  PIDController_Reset.vi  PIDController_SetD.vi  PIDController_SetD.vi  PIDController_SetDerivativeFilter.vi	Function Prototype	Advanced PID Advanced PID Labview style helper. Advanced PID  Labview style helper OBSOLETE – Removed  Advanced PID	8	76	En
PID CONTROLLER	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	SI   SI   SI   SI   SI   SI   SI   SI		PIDController_AdvCalculate_FF_Sp_Pv_Per.vi PIDController_AdvCalculate_FF_Sp_Pv.vi  PIDController_AdvExecute.vi  PIDController_AtSetpoint.vi  PIDController_Calculate_PV.vi  PIDController_Calculate_Sp_Pv.vi  PIDController_Calculate_Sp_Pv.vi  PIDController_DisableContinousInput.vi  PIDController_EnableContinousInput.vi  PIDController_Execute.vi  PIDController_GetContinuousError.vi  PIDController_GetPiD.vi  PIDController_GetPiD.vi  PIDController_GetPositionError.vi  PIDController_GetSetpoint.vi  PIDController_GetVelocityError.vi  PIDController_GetVelocityError.vi  PIDController_New.vi  PIDController_NewPeriod.vi  PIDController_NewPeriod.vi  PIDController_Pack_AdvLimits.vi  PIDController_Pack_AdvIning.vi  PIDController_Pack_InputLimits.vi  PIDController_Pack_InputLimits.vi  PIDController_Pack_Tuning.vi  PIDController_Pack_Tuning.vi  PIDController_Reset.vi  PIDController_SetD.vi  PIDController_SetDerivativeFilter.vi  PIDController_SetFeedForward_OBSOLETE_DELETE.vi	Function Prototype	Advanced PID Advanced PID Labview style helper. Advanced PID  Labview style helper OBSOLETE – Removed  Advanced PID  Advanced PID  Advanced PID, Obsolete – DELETE	8	7	En

X	Χ		X	SI	PIDController_SetIntegratorRange.vi		
Χ	Χ	Χ	X	SI	PIDController_SetOutputLimits.vi	Advanced PID	
Χ	Χ		Χ	SI	PIDController_SetP.vi		
X	X	X	X	SI	PIDController_SetPeriod.vi		
X	Χ		X	SI	PIDController_SetPID.vi		
Χ	Χ	X	X	SI	PIDController_SetPIDF.vi	Advanced PID	
Χ	Χ		X	SI	PIDController_SetSetpoint.vi		
Χ	Χ		X	SI	PIDController_SetTolerance.vi		
X	X		X	SI	PIDController SetTolerancePandV.vi		

PROFILED PID CONTROLLER	Щ
X       X       X       ProfiledPIDController_Calculate_Meas_Goal.vi         X       X       X       X       ProfiledPIDController_Calculate_Meas_StateGoal.vi         X       X       X       X       ProfiledPIDController_Calculate_Meas.vi         X       X       X       X       ProfiledPIDController_Calculate_Meas.vi         X       X       X       X       ProfiledPIDController_DisableContinput.vi         X       X       X       X       X       X       X         X	
X       X       X       X       ProfiledPIDController_Calculate_Meas_StateGoal_vi         X       X       X       X       X       ProfiledPIDController_Calculate_Meas_StateGoal_vi         X       X       X       X       X       ProfiledPIDController_Calculate_Meas_vi         X       X       X       X       SI       ProfiledPIDController_DisableContlnput.vi         X       X       X       SI       ProfiledPIDController_EnableContlnput.vi         X       X       X       X       Inchestian in the profiled	
X       X       X       X       ProfiledPIDController_Calculate_Meas_StateGoal.vi         X	
X       X       X       X       Y       ProfiledPIDController_Calculate_Meas.vi       X <td></td>	
X       X       SI       ProfiledPIDController_DisableContInput.vi         X       X       X       SI       ProfiledPIDController_EnableContInput.vi         X       X       X       X       I       ProfiledPIDController_Execute.vi         X       X       X       X       SI       ProfiledPIDController_GetGoal.vi         X       X       X       X       SI       ProfiledPIDController_GetPeriod.vi         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       SI       ProfiledPIDController_EnableContInput.vi         X       X       X       X       X       I       ProfiledPIDController_Execute.vi       Single call LabVIEW style function.         X       X       X       X       SI       ProfiledPIDController_GetGoal.vi       ProfiledPIDController_GetPriod.vi         X       X       X       X       X       SI       ProfiledPIDController_GetPID.vi       WPILIB has separate getters.         X       X       X       X       SI       ProfiledPIDController_GetPositionError.vi         X       X       X       SI       ProfiledPIDController_GetSetpoint.vi	
X       X       X       X       I       ProfiledPIDController_Execute.vi       Single call LabVIEW style function.         X       X       X       X       SI       ProfiledPIDController_GetGoal.vi       ProfiledPIDController_GetPid.vi         X       X       X       X       X       SI       ProfiledPIDController_GetPID.vi       WPILIB has separate getters.         X       X       X       X       SI       ProfiledPIDController_GetPositionError.vi         X       X       X       SI       ProfiledPIDController_GetSetpoint.vi	
X     X     X     SI     ProfiledPIDController_GetGoal.vi       X     X     X     SI     ProfiledPIDController_GetPeriod.vi       X     X     X     X     SI     ProfiledPIDController_GetPID.vi       X     X     X     SI     ProfiledPIDController_GetPositionError.vi       X     X     X     SI     ProfiledPIDController_GetSetpoint.vi	
X     X     SI     ProfiledPIDController_GetPeriod.vi       X     X     X     X     SI     ProfiledPIDController_GetPID.vi       X     X     X     SI     ProfiledPIDController_GetPositionError.vi       X     X     X     SI     ProfiledPIDController_GetSetpoint.vi	
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         SI         ProfiledPIDController_GetPositionError.vi           X         X         X         SI         ProfiledPIDController_GetSetpoint.vi	
X X X SI ProfiledPIDController_GetSetpoint.vi	
X     X     SI     ProfiledPIDController_GetSetpoint.vi       X     X     X     SI     ProfiledPIDController_GetVelocityError vi	
X X X SI ProfiledPIDController GetVelocityError vi	
X X X I ProfiledPIDController_New.vi	
X X I ProfiledPIDController_NewPeriod.vi	
X X SI ProfiledPIDController_Reset_PosOnly.vi	
X X SI ProfiledPIDController_Reset_PosVel.vi	
X X SI ProfiledPIDController_Reset.vi	
X X SI ProfiledPIDController_SetConstraints.vi	
X X SI ProfiledPIDController_SetGoal_PosOnly.vi	
X X SI ProfiledPIDController_SetGoal.vi	
X X SI ProfiledPIDController_SetIntegratorRange.vi	
X X SI ProfiledPIDController_SetPID.vi	
X X SI ProfiledPIDController_SetTolerance_PosOnly.vi	
X X SI ProfiledPIDController_SetTolerance_PosVel.vi	

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optim	Test Routine	Sample Progran	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
RAMSETE	Χ	X		X	SI			Ramsete_AtReference.vi	AtReference				
	Χ	Χ		Χ	Χ			Ramsete_Calculate_Trajectory.vi	calculate_trajectory				
	Χ	Χ		Χ	Χ			Ramsete_Calculate.vi	calculate				
	Χ	Χ	Χ	Χ	Χ			Ramsete_Diff_DO_Eng.vi					
	Χ	Χ	Χ	Χ	Χ			Ramsete_Diff_DO_SI.vi					
	Χ	X	X	X	1			Ramsete_Execute_ENG.vi	Use this one!!				
	Χ	Χ	Χ	Χ	SI			Ramsete_Execute_PackTuning_ENG.vi					
	Χ	Χ	Χ	Χ	SI			Ramsete_Execute_PackTuning.vi					
	Χ	Χ	Χ	Χ	1			Ramsete_Execute.vi					
	Χ	Χ		Χ	SI			Ramsete_New_B_Z.vi	new(b, zeta)				
	Χ	Χ		Χ	SI			Ramsete_New.vi	new				
	Χ	Χ		Χ	SI			Ramsete_SetEnabled.vi	SetEnabled				
	Χ	X		Χ	SI			Ramsete_SetTolerance.vi	SetTolerance				

FRC LabVIEW Trajectory Library - VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. Ramsete SINC.vi  $X \mid X$ sinc internal Execution Optimized Not WPILIB ltem Function Prototype Notes SIMPLE MOTOR FEEDFORWARD X X Χ SI SimpleMotorFF Calculate CalcAccel.vi SimpleMotorFF Calculate\_NextV\_Dt.vi Χ Χ Χ XX X SI SimpleMotorFF Calculate.vi public double calculate(double velocity, double acceleration) XX X SI SimpleMotorFF\_CalculateVelocityOnly.vi public double calculate(double velocity) SimpleMotorFF MaxAchieveAccel.vi X X X public double maxAchievableAcceleration(double maxVoltage, double velocity) X X Χ SimpleMotorFF\_MaxAchieveVel.vi public double maxAchievableVelocity(double maxVoltage, double acceleration) X X SimpleMotorFF MinAchieveAccel.vi public double minAchievableAcceleration(double maxVoltage, X double velocity) X X X SimpleMotorFF\_MinAchieveVel.vi public double minAchievableVelocity(double maxVoltage, double X X X SI SimpleMotorFF New.vi public SimpleMotorFeedforward(double ks, double kv, double ka) public SimpleMotorFeedforward(double ks, double kv) '======= **GEOMETRY** '======== VI Name Function Prototype Notes POSE2D Χ Χ Χ SI Pose2d Equals.VI boolean equals( other obj ) X Χ Χ Pose2d Exp.vi pose2d exp( twist2d twist ) X X SI Pose2d getRotation.vi X rotation2d getRotation() can also use cluster unpack Χ Χ X SI Pose2d getTranslation.vi translation2d getTranslation() can also use cluster unpack Pose2d\_getXY.vi X X X X SI Χ X X X SI Pose2d\_getXYAngle.vi XX X I Pose2d Interpolate.vi XX XX Pose2d Log.vi twist2d log( pose2d end ) X X Pose2d\_Minus.vi X SI transform2d minus( pose2d other ) Χ X X SI Pose2d New TRRO.vi pose2d new( translation2d, rotation2d ) X X X SI Pose2d New.vi pose2d new( double x, double y, rotation2d ) Χ X X SI Pose2d Plus.vi pose2d plus( transform2d other ) X SI Pose2d RelativeTo.vi X pose2d relativeto( pose2d other ) XX X SI Pose2d TransformBy.vi pose2d transformby( transform2d other ) pose2d new() can use cluster constant Function Prototype Notes POSE3D X SI Pose3d Equals.VI Χ Pose3d Exp.vi X Pose3d getRotation.vi SI Χ Pose3d getTranslation.vi SI Χ SI Pose3d\_getXYZ.vi X

X

X

X

X

1

SI

SI

Pose3d Interpolate.vi

Pose3d Log.vi

Pose3d Minus.vi

Pose3d New.vi

FRC LabVIEW Trajectory Library - VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. Pose3d New Default.vi Χ SI Pose3d New Trans3dRot3d.vi Χ SI Pose3d Plus.vi X SI Pose3d RelativeTo.vi Χ Pose3d RotationVectorToMatrix.vi SI X SI Pose3d ToPose2d.vi SI Pose3d TransformBy.vi Function Prototype VI Name Notes QUATERNION X SI Quaternion Equals.vi Quaternion Get All.vi X SI Χ SI Quaternion\_Get\_LVQuat.vi Χ SI Quaternion Get Vect.vi Quaternion Get W.vi Χ SI X SI Quaternion Inverse.vi Χ SI Quaternion New.vi Χ SI Quaternion\_New\_Default.vi X SI Quaternion\_New\_LVQuat.vi X SI Quaternion Normalize.vi X SI Quaternion Plus.vi X SI Quaternion Times.vi Χ SI Quaternion ToRotationVector.vi ltem Function Prototype Notes XX X SI ROTATION2D Rotation2d CreateAngle.vi rotation2d new( double value ) XX X SI Rotation2d\_CreateAngleDegrees.vi rotation2d fromDegrees( double degrees ) convert to radians then create XX X SI Rotation2d CreateAngleRotations.vi XX X SI Rotation2d CreateXY.vi rotation2d new( double x, double y ) X SI Rotation2d\_Equals.vi X X boolean equals( rotation2d other ) X X X SI Rotation2d GetAngleCosSin.vi New 1/26/21 X use cluster unpack Χ SI Rotation2d GetCos.VI X X double getCos() Rotation2d GetDegrees.VI X X SI double getDegrees() use cluster unpack, then convert to Rotation2d GetRadians.VI XX X SI double getRadians() use cluster unpack Rotation2d GetRotations.vi XX X SI X SI Rotation2d\_GetSin.VI Χ Χ use cluster unpack double getSin() X SI Χ X Rotation2d GetTan.VI can calculate double getTan() X X X SI Rotation2d Interpolate.vi X X SI Rotation2d Minus.vi rotation2d minus( rotation2d other ) Χ X X SI Rotation2d Plus.vi rotation2d plus( rotation2d other ) X Χ X SI Rotation2d\_RotateBy.vi rotation2d rotateby( rotation2d other ) Χ Χ X SI Rotation2d Times.vi rotation2d times( double scalar ) XX X SI Rotation2d UnaryMinus.vi rotation2d unaryminus() rotation2d new() can use cluster constant

> recution Optimized Error Checking Test Program est Routine Not WPILIB Menu Item Function Prototype Notes

FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time interp

del follower and time i		atable	routi	nes.				_				
ROTATION3D					SI		Rotation3d_Create_AxisAngle.vi					
ito i / ti i o ito z	X				SI		Rotation3d Create Default.vi					
	^											
	Χ				SI		Rotation3d_Create_Quaternion.vi					
	X				SI		Rotation3d_Create_RollPitchYaw.vi					
	X				SI		Rotation3d_Equals.vi					
	X		Χ		SI		Rotation3d_GetAxisAngle.vi					
	X		^		SI		Rotation3d_GetQuaternion.vi					
-												
	X				SI		Rotation3d_GetXYZ.vi					
	X				SI		Rotation3d_Interpolate.vi					
	X				SI		Rotation3d_Minus.vi					
	Х				SI		Rotation3d Plus.vi					
	X				SI		Rotation3d RotateBy.vi					
	Χ				SI		Rotation3d_Times.vi					
	X						Rotation3d_ToRotation2d.vi					
	X				SI		Rotation3d_UnaryMinus.vi					
TRANSFORM2D	X X X	X X X	Not WPILIB	X X Menu Item	ଓ ଓ ଓ Execution Optimized	Test Routine	VI Name Transform2d_Create_PosePose.vi Transform2d_Create_TransRot.vi Transform2d_Equals.VI Transform2d_GetRotation.VI	Function Prototype transform2d new( pose2d, pose2d ) transform2d new( translation2d, rotation2d ) boolean equals( other transform2d ) rotation2d getRotation()	Notes  use cluster unpack	Code Review	Test Program	Error Checking
		Χ		Χ	SI		Transform2d_GetTranslation.VI	translation2d getTranslation()	use cluster unpack			
	X	X	X	Χ	SI		Transform2d GetXY.vi					
	X	Χ	X	Χ	SI		Transform2d_GetXYAngle.vi					
-		X	,	X	SI		Transform2d Inverse.vi	transform inverse()	new			
-								uansionii iiveise()	ITEW	-		
	X	X		Χ	Si		Transform2d_Plus.vi					
	X	Χ		Χ	SI		Transform2d_Times.vi	transform2d times( double scalar )				
								transform2d new()	can use cluster constant			
TRANSFORM3D	X X X X X X X X X X X X X X X X X X X		X Not WPILIB	Menu Item	IS I	Test Routine	VI Name Transform3d Create Default.vi Transform3d Create Pose3dPose.3dvi Transform3d Create Trans3dRot3d.vi Transform3d Equals.VI Transform3d GetRotation3d.VI Transform3d GetTranslation3d.VI Transform3d GetXYZ.vi Transform3d Inverse.vi Transform3d Plus.vi Transform3d Times.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
TRANSLATION2D	X X X	X Documented	Not WPILIB	X X Menu Item	ଓ ଓ Execution Optimized	Test Routine	VI Name Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Equals.vi Translation2d GetDistance.vi	Function Prototype  translation2d new( double x, double y ) boolean equals( translation other ) double getDistance( translation2d other )	Notes	Code Review	Test Program	Error Checking

FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. XX Translation2d GetNorm.VI double getNorm() X SI can use cluster unpack XX X SI Translation2d GetX.VI double getX() can use cluster unpack X X X X SI Translation2d GetXY.VI XX X SI Translation2d GetY.VI double getY() can use cluster unpack Translation2d Interpolate.vi  $X \mid X$ X SI Translation2d Minus.vi  $X \mid X$ X SI translation2d minus( translation2d other ) Χ Translation2d Plus.vi X SI translation2d plus( translation2d other ) X Χ X SI Translation2d\_RotateBy.vi translation2d rotateBy( rotation2d other ) Χ X X X SI Translation2d Times.vi translation2d times( double scalar ) XX X SI Translation2d UnaryMinus.vi translation2d unaryminus() translation2d new() can use cluster constant translation2d div( double scalar ) can multiply by 1/scalar est Program Vot WPILIB Test Routin VI Name Function Prototype Notes TRANSLATION3D Χ Translation3d Create.vi SI Χ SI Translation3d Create Default.vi Translation3d Create DistAng.vi Χ SI Χ SI Translation3d\_Div.vi X SI Translation3d\_Equals.vi Χ SI Translation3d\_GetDistance.vi X SI Translation3d GetNorm.VI X Translation3d GetXYZ.vi Χ SI X Translation3d Interpolate.vi SI Χ Translation3d Minus.vi SI Χ SI Translation3d Plus.vi Χ SI Translation3d RotateBy.vi X SI Translation3d Times.vi Χ SI Translation3d ToTranslation2d.vi Χ SI Translation3d UnaryMinus.vi Routine VI Name Function Prototype Notes TWIST2D X Twist2d Create.vi SI twist new(x, y, theta) X X X SI Twist2d\_Equals.VI boolean equals( obj other ) X Twist2d GetAll.VI X X X X SI sed

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimiz	Test Routine	Sample Program In Manageria	Function Prototype	Notes	Code Review	Test Program	Error Checking
TWIST3D	X				SI	X	Twist3d_Create.vi					
	X				SI	Χ	Twist3d_Equals.VI					
	X		Χ		SI	Χ	Twist3d_GetAll.VI					

'======== **KINEMATICS** '========

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rajectory Library – VI Implementation	LIST								_				
022 – added implicit model follower and time	interpo	olatab	le rout	lines.	75								
CHARGIS SDEEDS	Implemented	< Documented	Not WPILIB	< Menu Item	   Execution Optimize	Test Routine	Sample Program	VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
CHASSIS SPEEDS	X	X		X	SI			ChassisSpeeds_FromFieldRelativeSpeeds.VI	chassisspeeds fromFieldRelativeSpeeds( double x, double y, double anguel, rotation2d robotangle )				
	X	Χ	X		SI			ChassisSPeeds_GetXYOmega.vi					
	X	Χ		X	SI			ChassisSpeeds_New.vi	chassisspeeds new ( double xvel, double yvel, double angvel )				
									chassisspeeds new ()	can use cluster constant			
DIFFERENTIAL DRIVE KINEMATICS	X X X Implemented	X X Documented	Not WPILIB	X X Menu Item	X	X X Test Routine		VI Name DiffKinematics_New.vi DiffKinematics_toChassisSpeed.vi DiffKinematics_toWheelSpeed.vi	Function Prototype  diffDriveKine new( double trackWidth )  chassisSpeeds toChassisSpeeds( diffDrWheelSpeeds )  diffDriveWheelSpeed toWheelSpeeds( chassisSpeeds )	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE ODOMETRY	X   Implemented	X Documented	X Not WPILIB	X Menu Item	X Execution Optin	Test Routine		VI Name DiffOdometry_Execute.vi DiffOdometry_Update.vi	Function Prototype  pose2d update( rotation2d gyro, double leftdist, double right dist )  diffDrOdom new( rotation gyro, pose initial )  diffDrOdom new( rotation gyro )  void resetPosition( pose2d, rotation2d )  pose2d getPoseMeters()	Notes  DONT NEED Incorporates enhanced reset incorporated into "update"	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE WHEEL SPEEDS	X Implemented	Documente	Not WPILIB	Menu Item	Execution Optimized	Test Routine		VI Name DiffWheel_Normalize.vi	Function Prototype  diffDrWheelSpeeds new()  diffDrWheelSpeeds new( double leftVel, double rightVel )  void normalize( double maxVel )	Notes	Code Review	Test Program	Error Checking
MECANUM DRIVE KINEMATICS	X Implemented	X Documented	Not WPILIB	X Menu Item		Test Routine		VI Name  MecaKinematics_New.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	Χ	X		X	X			MecaKinematics_SetInverseKinematics.vi					
	Χ	X		X	X			MecaKinematics_ToChassisSpeeds.vi					
	X	Χ		X				MecaKinematics_ToWheelSpeeds.vi					
	X	X		X	X			MecaKinematics_ToWheelSpeedsZeroCenter.vi					

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Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. Function Prototype Notes **MECANUM DRIVE MOTOR VOLTAGE** nothing done Function Prototype Notes **MECANUM DRIVE ODOMETRY** MecaOdometry\_Execute.vi Χ X X MecaOdometry GetPose.vi XX X MecaOdometry New.vi  $X \mid X$ Χ MecaOdometry NewDefaultPose.vi Χ MecaOdometry Reset.VI X X Χ X MecaOdometry\_Update.vi X Χ X X MecaOdometry\_UpdateWithTime.vi Not WPILIB VI Name Function Prototype Notes MECANUM DRIVE WHEEL SPEEDS X X SI MecaWheel New.Vi public MecanumDriveWheelSpeeds(double frontLeftMetersPerSecond, double frontRightMetersPerSecond, double rearLeftMetersPerSecond, double rearRightMetersPerSecond)
public void normalize(double Χ Χ MecaWheel\_Normalize.vi X attainableMaxSpeedMetersPerSecond) Optim Menu Item Function Prototype VI Name Notes SWERVE DRIVE KINEMATICS X SwerveKinematics New4.VI For 4 module drives Χ XX Χ XX SwerveKinematics NewX.VI uses array as input Χ SwerveKinematics NormalizeWheelSpeeds.vi public static void normalizeWheelSpeeds(SwerveModuleState[] moduleStates, double attainableMaxSpeedMetersPerSecond) Χ SwerveKinematics\_ToChassisSpeeds4.VI XXX For 4 module drives SwerveKinematics\_ToChassisSpeedsX.VI Χ X X X uses array as input public SwerveModuleState[] X SwerveKinematics ToSwerveModuleStates.VI toSwerveModuleStates(ChassisSpeeds chassisSpeeds, Translation2d centerOfRotationMeters) Χ SwerveKinematics ToSwerveModuleStatesZeroCenter.VI public SwerveModuleState[] X toSwerveModuleStates(ChassisSpeeds chassisSpeeds) public SwerveDriveKinematics(Translation2d... wheelsMeters) variable parameters (replace with array and "4" calls) public ChassisSpeeds toChassisSpeeds(SwerveModuleState... variable parameters (replace with array and "4" calls)

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ble routines.    Barrier   Barrier	Execution Optimized	lest Koutine Samile Drogram	VI Name  SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI  SwerveOdometry_NewZeroCenter.VI  SwerveOdometry_ResetPosition.VI SwerveOdometry_Update4.VI	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)	Notes	Code Review	Test Program	
X	Execution Optimiz	lest Koutifie	SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI SwerveOdometry_NewZeroCenter.VI SwerveOdometry_ResetPosition.VI	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)	Notes	Code Review	Test Program	
X	Exec	l est	SwerveOdometry_Execute4.vi SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI SwerveOdometry_NewZeroCenter.VI SwerveOdometry_ResetPosition.VI	public Pose2d getPoseMeters() public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)	Notes	Code	Test	
X			SwerveOdometry_ExecuteX.vi SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI SwerveOdometry_NewZeroCenter.VI SwerveOdometry_ResetPosition.VI	public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)				
X			SwerveOdometry_GetPosition.VI SwerveOdometry_New.VI SwerveOdometry_NewZeroCenter.VI SwerveOdometry_ResetPosition.VI	public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)				
X			SwerveOdometry_New.VI SwerveOdometry_NewZeroCenter.VI SwerveOdometry_ResetPosition.VI	public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)				
X   X   X   X   X   X   X   X   X   X			SwerveOdometry_NewZeroCenter.VI SwerveOdometry_ResetPosition.VI	public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle)				
X   X   X   X   X   X   X   X   X   X				public void resetPosition(Pose2d pose, Rotation2d gyroAngle)				
X   X   X   X   X   X   X   X   X   X				i i i i i i i i i i i i i i i i i i i	1			
XX					For 4 module drives			
X X X X			SwerveOdometry_UpdateWithTime4.VI		For 4 module drives			
XX			SwerveOdometry_UpdateWithTimeX.VI		uses array as input			
			SwerveOdometry_UpdateX.VI	public Pose2d updateWithTime(double currentTimeSeconds,	uses array as input variable parameters (replace with array and "4" calls)			
				public Pose2d update(Rotation2d gyroAngle,	variable parameters (replace with			
				SwerveModuleState moduleStates)	array and "4" calls)			
t WPILIB nu Item	ecution Optimized	st Koutine male Drogram				de Review	st Program	
Not Me	ı Ü	Se / es	S VI Name	Function Prototype	Notes	Š	7es	
X	SI		SwerveModuleState_CompareTo.vi	public int compareTo(SwerveModuleState o)			•	
			SwerveModuleState_Get.vi					
X	SI		SwerveModuleState_New.vi	public SwerveModuleState(double speedMetersPerSecond,				
X	SI		SwerveModuleState_Optimize.vi	public SwerveModuleState optimize( SwerveModuleState desired,				
	mized	§						
ω.	Dpti	7				Né	ш	
HE HE			•			œ Xiç	gra	
N 2	ı Çti	8 8					Ä	
lot 1en	ě.	est	VI Nama	Function Prototyno	Notes	00	est	
_	_ Щ _ !	0	) Villanie			- 0	<u> </u>	
X			CubicHermiteSpline_getControlVectorFromArrays.vi	private SimpleMatrix getControlVectorFromArrays( double[] initialVector, double[] finalVector)	not needed, use cluster unpack			
X				private SimpleMatrix makeHermiteBasis()				
			CubicHermiteSpline_New.vi	public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector)				
	Not WPILIB  X  X  X  X	Not WPILIB  X  X  X  SI  X  X  SI  X  X  X  X  SI  X  X  X  SI  X  X  X  SI  X  X  X  X  X  X  X  X  X  X  X  X  X	Not WPILIB  X  X  Execution Optimized  Test Routine  Sample Program	X   SI   SwerveModuleState_CompareTo.vi	X   S/   SwerveModuleState_CompareTo.vi   public int compareTo(SwerveModuleState o)	X   SI   SwerveModuleState_CompareTo.vi   public int compareTo(SwerveModuleState o)	X   SI   SwerveModuleState CompareTo.vi   public int compareTo(SwerveModuleState o)	X   S/   SwerveModuleState_CompareTo.vi   public int compareTo(SwerveModuleState o)

'====== SPLINE '======= FRC LabVIEW Trajectory Library – VI Implementation List
Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines.

QUINTIC HERMITE SPLINE	X X Implemented	X X Documented	Not WPILIB	X X Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name  QuinticHermiteSpline_getControlVectorFromArrays.vi  QuinticHermiteSpline_makeHermiteBasis.vi  QuinticHermiteSpline_New.vi	private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public QuinticHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yFinalControlVector)	Notes  not needed, use cluster unpack	Code Review	Test Program	Error Checking
SPLINE (Abstract class)	X Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name Spline_getPoint.vi	Function Prototype public PoseWithCurvature getPoint(double t) Spline(int degree)	Notes	Code Review	Test Program	Error Checking
									public static class ControlVector				
									public ControlVector(double[] x, double[] y)	implemented as data structure			
SPLINE HELPER	X Implemented	X Documented	Not WPILIB	X Menu Item	ত Execution Optimizec	Test Routine	Sample Program	VI Name SplineHelp_GetCubicCtrlVector.vi	private static Spline.ControlVector getCubicControlVector(double scalar, Pose2d point)	Notes	Code Review	Test Program	Error Checking
	X	X		X		X		SplineHelp_GetCubicCtrlVectorsFromWayPts.vi	public static Spline.ControlVector[] getCubicControlVectorsFromWaypoints( Pose2d start, Translation2d[] interiorWaypoints, Pose2d end )				
	Χ	X	X	X				SplineHelp_GetCubicCtrlVectorsFromWeightedWayPts.vi	Translationza[] interiorwaypoints, 1 oscza cha j				
	Χ	Χ	Χ	No				SplineHelp_GetCubicSpline_Calc1.vi		internal			
	Χ	Χ		No				SplineHelp_GetCubicSpline_Calc2.vi		internal			
	X	Χ	X	No				SplineHelp_GetCubicSpline_Calc3.vi		internal			
	X	X		X	SI	X		SplineHelp_getCubicSplinesFromControlVectors.vi SplineHelp_GetQuinticCtrlVector.vi	public static CubicHermiteSpline[] getCubicSplinesFromControlVectors( Spline.ControlVector start, Translation2d[] waypoints, Spline.ControlVector end) private static Spline.ControlVector getQuinticControlVector(double				
									scalar, Pose2d point)				
								SplineHelp_GetQuinticCtrlVectorsFromWayPts.vi	getQuinticControlVectorsFromWaypoints( List <pose2d> waypoints )</pose2d>	REMOVED 2762			
	X	X		X				SplineHelp_GetQuinticCtrlVectorsFromWeightedWayPts.vi SplineHelp_getQuinticSplinesFromControlVectors.vi	public static QuinticHermiteSpline[] getQuinticSplinesFromControlVectors( Spline.ControlVector[] controlVectors)	REMOVED 2762			
	Χ	Χ	X	X				SplineHelp_GetQuinticSplinesFromWeightedWayPts.vi	Control v Cotors	New 2762			
	Χ	X		X				SplineHelp_GetQuinticSplinesFromWayPts.vi		New 2762			
	X	X		No				SplineHelp_ThomasAlgorithm.vi	private static void thomasAlgorithm(double[] a, double[] b, double[]				
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name	c, double[] d, double[] solutionVector)  Function Prototype	Notes	Code Review	Test Program	Error Checking

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FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. SPLINE PARAMETERIZER X SplineParam Spline T0 T1.vi public static List<PoseWithCurvature> parameterize(Spline spline, double t0, double t1) SplineParam Spline.vi public static List<PoseWithCurvature> parameterize(Spline spline) Χ 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** Menu Item Function Prototype VI Name Notes TRAJECTORY X X X Trajectory Concatenate.vi X X Χ Trajectory\_equals.vi boolean equals( other obj ) **FUTURE** Χ Χ SI Trajectory GetStates.vi public List<State> getStates() X not needed, use unpack Χ X Χ 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, Χ Χ SI Trajectory\_lerp\_Pose.vi private static Pose2d lerp(Pose2d startValue, Pose2d endValue, No internal XX X SI Trajectory New Empty.vi XX X SI Trajectory\_New.vi public Trajectory(final List<State> states) XX public Trajectory relativeTo(Pose2d pose) Χ Trajectory RelativeTo.vi public State sample(double timeSeconds)  $X \mid X$ X Trajectory\_Sample.vi Χ X Trajectory\_SampleReverse.vi X X Sample in reverse order. Negate XX Χ Trajectory TransformBy.vi public Trajectory transformBy(Transform2d transform) public Pose2d getInitialPose() can use cluster unpack, array index Optim ltem Function Prototype Notes TRAJECTORY\_STATE X X X SI TrajectoryState Equals.vi boolean equals( other obj ) X X TrajectoryState GetAll.vi Χ SI Χ X SI TrajectoryState\_GetPose.vi Χ Χ X X TrajectoryState\_Interpolate.vi State interpolate(State endValue, double i) SI TrajectoryState\_New.vi public State(double timeSeconds, double X X Χ velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State() Optimized Checking Program Not WPILIB Venu Item Test Function Prototype Notes public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq) TrajectoryConfig\_Create.vi TRAJECTORY CONFIG X X X X SI TrajectoryConfig setCentripetalAccel.vi

public TrajectoryConfig setKinematics(DifferentialDriveKinematics

public TrajectoryConfig setKinematics(MecanumDriveKinematics

TrajectoryConfig setKinematicsDiffDrive.vi

TrajectoryConfig setKinematicsMecanumfDrive.vi

FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. SI TrajectoryConfig setKinematicsSwerveDrive.vi public TrajectoryConfig setKinematics(SwerveDriveKinematics kinematics) SI X Χ X TrajectoryConfig\_setReversed.vi public TrajectoryConfig setReversed(boolean reversed) TrajectoryConfig setVoltageDiffDrive.vi X X X X SI public TrajectoryConfig addConstraint(TrajectoryConstraint Implemented differently, can't constraint) public TrajectoryConfig addConstraints(List<? extends Implemented differently, can't TrajectoryConstraint> constraints)
public double getStartVelocity() duplicate 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 public boolean isReversed() can use cluster unpack NOTE ADD OTHER "SET" ROUTINES FOR OTHER CONTRAINTS HERE, SINCE NEW CONTRAINTS ARE SPECIFIC AND NOT GENERIC. Checkin Vot WPILIB Routir Menu Item Function Prototype Notes TRAJECTORY GENERATE X X X TrajectoryGenerate\_Make\_Cubic\_CtrlVect.vi public static Trajectory generateTrajectory( Spline.ControlVector uses cubic splines initial, List<Translation2d> interiorWaypoints, Spline.ControlVector end, TrajectoryConfig config ) public static Trajectory generateTrajectory( Pose2d start, List<Translation2d> interiorWaypoints, Pose2d end, X X Χ TrajectoryGenerate Make Cubic.vi uses cubic splines TrajectoryConfig config )
Helper to bring these all together...  $X \mid X \mid X$ X TrajectoryGenerate Make Generic.vi Use this one!!! TrajectoryGenerate Make Quintic CtrlVect.vi public static Trajectory generateTrajectory( ControlVectorList X X X uses quintic splines controlVectors, TrajectoryConfig config) TrajectoryGenerate Make Quintic Weighted.vi X X X Χ New 2762 public static Trajectory generateTrajectory(List<Pose2d> Χ Χ Χ TrajectoryGenerate Make Quintic.vi uses quintic splines waypoints, TrajectoryConfig config)
public static List<PoseWithCurvature> X X X TrajectoryGenerate splinePointsFromSplines.vi splinePointsFromSplines(Spline∏ splines) ution Optimized Checkir Jot WPILIB lenu Item VI Name Function Prototype Notes TRAJECTORY GENERATE (Control Vector) may not need, just data public ControlVectorList(int initialCapacity) public ControlVectorList() may not need, just data public ControlVectorList(Collection<? extends may not need, just data Spline.ControlVector> collection) ecution Optimized Routine Vot WPILIB ltem **Function Prototype** Notes TRAJECTORY PARAMETERIZE X X X No TrajectoryParam calcStuffFwd.vi

X

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Χ

X

X No

No

TrajectoryParam calcStuffRev.vi

TrajectoryParam enforceAccel.vi

This routines needs to be changed

when new constraints are added.

private static void enforceAccelerationLimits(boolean reverse, List<TrajectoryConstraint> constraints, ConstrainedState state) Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. X TrajectoryParam enforceVelocity.vi This routines needs to be changed nen new constraints are added Χ public static Trajectory TrajectoryParam timeParam.vi timeParameterizeTrajectory( List<PoseWithCurvature> points. List<TrajectoryConstraint> constraints, double startVelocityMetersPerSecond, double endVelocityMetersPerSecond, double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSg, boolean reversed) Execution Optimized Not WPILIB VI Name Function Prototype Notes TRAJECTORY PARAMETERIZE CONSTRAINED STATE X X ConstrainedState New.vi ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double maxAccelerationMetersPerSecondSq) ConstrainedState SetMaxAccel.vi X X X X X X ConstrainedState SetMinAccel.vi Χ ConstrainedState SetVelAccel.vi X X X X X X ConstrainedState SetVelocity.vi ConstrainedState() Optim Routine Function Prototype Notes TRAJECTORY UTIL X X TrajectoryUtil\_fromPathWeaverJSON.vi public static Trajectory fromPathweaverJson(Path path) X X X X X X TrajectoryUtil\_MakeWeightedWayPoint\_ENG.vi X X X X X TrajectoryUtil MakeWeightedWayPoint.vi X X TrajectoryUtil toPathWeaverJSON.vi public static void toPathweaverJson(Trajectory trajectory, Path public static Trajectory deserializeTrajectory(String json) public static String serializeTrajectory(Trajectory trajectory) Execution Optii Function Prototype TRAPEZOID PROFILE X TrapProfConstraint New.vi Χ TrapProfile Calculate.vi Χ X X XX TrapProfile Direct.vi No Private, remove from menu X X X X TrapProfile Execute.vi X X X X SI TrapProfile Execute AtGoal.vi TrapProfile IsFinished.vi XX Χ TrapProfile New DefInitial.vi Χ X X Χ X X TrapProfile New.vi X No TrapProfile ShouldFlipAcceleration.vi Private, remove from menu Χ Χ Χ Χ TrapProfile TimeLeftUntil.vi X TrapProfile TotalTime.vi X X TrapProfState\_Equals.vi Χ X Χ XX Χ TrapProfState New.vi

'====== TRAJECTORY CONSTRAINT '=======

FRC\_LabVIEW\_Trajectory\_Library\_Routines.xlsx

/IEW Trajectory Library – VI Implementation L	_ist								_	
X 5/2/2022 – added implicit model follower and time	interp	olatab	le rout	tines.						
CENTRIPETAL ACCELERATION CONSTRAINT	X Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name  CentripetalAccelConstraint_getMaxVelocity.vi  CentripetalAccelConstraint_getMinMaxAccel.vi	Function Prototype  public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)  public MinMax  getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	Notes
	X	X		X	SI			CentripetalAccelConstraint_New.vi		Can use cluster pack for now
	mplemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name		Notes
DIFF DRIVE KINEMATIC CONSTRAINT	X	X		X	F			DiffDriveKinematicsConstraint_getMaxVelocity.vi	public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double	Notes
	X	X		X				DiffDriveKinematicsConstraint_getMinMaxAccel.vi	velocityMetersPerSecond) 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	X Implemented	X Documented	Not WPILIB	X Menu Item	Execution Optimized	Test Routine	Sample Program	VI Name DiffDriveVoltageConstraint_getMaxVelocity.vi	Function Prototype  public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond)	Notes
	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		Notes
JERK CONSTRAINT	1		Χ					JerkConstraint_getMaxVelocity.vi		FUTURE
	/		X		_			JerkConstraint_getMinMaxAccel.vi		FUTURE
	/		Χ		SI			JerkConstraint_New.vi	Routine exists, it is just a shell	FUTURE

FRC\_LabVIEW\_Trajectory\_Library\_Routines.xlsx

Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. Function Prototype Notes MECANUM DRIVE KINEMATICS CONSTRAINT XMecaDriveKinematicsConstraint\_getMaxVelocity.vi MecaDriveKinematicsConstraint\_getMinMaxAccel.vi X X X X

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)

X SI

Function Prototype Notes TRAJECTORY CONSTRAINT (Min Max) X Constraint\_MinMax\_New.vi Constraint\_MinMax\_New X X X SI Constraint\_MinMax\_NewMinMax.VI Constraint\_MinMax\_New

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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	Nample Program	Function Prototype	Notes
UTIL		X	X	X	SI		Util_ApproxEqual.vi	,	
	Χ	Χ	Χ	Χ			Util_Array_PoseWCurv_to_XY.vi		
	Χ	X	Χ	Χ	SI		Util_CalcDist.vi		
	Χ	X	Χ	Χ	SI		Util_GetLibraryVersion.vi		
	Χ	X	X	X	SI		Util_GetLibUsage.vi		
	Χ	X	X	X			Util_GetTime.vi		Once tested completely, this should be optimized!
	Χ	Χ	Χ	No	N/A		Util_LibraryGlobals.vi		Global Variables – no block diag.
	Χ	Χ	Χ	Χ			Util_Trajectory_Absolute_To_Relative.vi		
	Χ	Χ	Χ	Χ			Util_Trajectory_ReadFile.vi		
	Χ	X	Χ	Χ			Util_Trajectory_to_XY.vi		
	Χ	X	X	No			Util_Trajectory_WriteFile_Config.vi		internal
	Χ	X	X	No			Util_Trajectory_WriteFile_OneState.vi		internal

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ne interp	olatab	le rou	tines.		
X	X	X	X	Util_Trajectory_WriteFile_PathFinder.vi	
X	X	Χ	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_DispWaypoint_Eng_To_SI.vi	
X	X	X	X	Util_DispWaypoint_To_CubicInput.vi	
X	X	X	X	Util_DispWaypoint_To_QuinticInput.vi	
X	X	X	X	Util_DispWeightedWaypiont_Eng_To_WeightedWaypoint	
X	X	X	No	Util_DispWeightedWayPoint_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	Χ	Χ	Χ	Χ	SI			Conv_AngleDegrees_Heading.vi		
	Χ	Χ	Χ	Χ	SI			Conv_AngleRadians_Heading.vi		
	Χ	X	Χ	Χ	SI			Conv_Centimeters_Meters.vi		
	Χ	X	Χ	Χ	SI			Conv_Deg_Radians.vi		
	Χ	X	Χ	Χ	SI			Conv_Deg_Rotations.vi		
	X	X	X	Χ	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_Pose2d_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_Radians_Rotations.vi		
-	X	X	X	X	SI			Conv_Rotations_Deg.vi		
-	X	X	X	X	SI			Conv_Rotations_Radians.vi		
L	X	X	X	X	SI			Conv_Yards_Meters.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimiz	Test Routine	Sample Program	VI Name	Function Prototype	Notes
UNITS	Χ	Χ		X	SI			Units_DegreesToRadians.vi		
	X	Χ		X	SI			Units_DegreesToRotations.vi		
	Χ	Χ		X	SI			Units_FeetToMeters.vi		
	X	Χ		X	SI			Units_InchesToMeters.vi		
	X	Χ		X	SI			Units_MetersToFeet.vi		
	Χ	Χ		Χ	SI			Units_MetersToInches.vi		
	X	Χ		X	SI			Units_MillisecondsToSeconds.vi		
	Χ	Χ		X	SI			Units_RadiansPerSecondToRotationsPerMinute.vi		
	Χ	Χ		X	SI			Units_RadiansToDegrees.vi		
	Χ	Χ		X	SI			Units_RadiansToRotations.vi		
	Χ	Χ		X	SI			Units_RotationsPerMinuteToRadiansPerSecond.vi		
	Χ	Χ		Χ	SI			Units_RotationsToDegrees.vi		
	Χ	Χ		X	SI			Units_RotationsToRadians.vi		

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Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines.

| X | X | SI |

Units SecondsToMilliseconds.vi

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PATHFINDER UTIL

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

PATHFINDERUTIL X X X X

Function Prototype Notes PathfinderUtil\_Continuous\_Heading\_Difference.vi X X X X PathfinderUtil\_OptimizeTrajectoryStates.vi X X X X X X X X PathfinderUtil\_ToTrajectory.vi
PathfinderUtil\_ToTrajectoryStates.vi

'=======

STATE SPACE MODEL

'=========

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

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FRC LabVIEW Trajectory Library – VI Implementation List
Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines.
STATE SPACE ESTIMATION
'===========

Implemented			Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE POSE ESTIMATOR X X X		DiffDrivePoseEst_AddVisionMeasurement.vi					
X   X   X   X   X   X   X   X   X   X		DiffDrivePoseEst_FillStateVector.vi DiffDrivePoseEst_GetEstimatedPosition.vi					
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		DiffDrivePoseEst Kalman F Callback.vi					
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		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					
$X \mid X \mid X$		DiffDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi					
Implemented  Documented  Not WPILIB  Menu ttem		g VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
EXTENDED KALMAN FILTER X 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   X   X   X   X   X   X   X		ExtendedKalmanFilter_GetP.vi ExtendedKalmanFilter_GetXHat_Single.vi					
		ExtendedKalmanFilter GetXHat.vi					
Y   Y     Y		Extended taimain inter Octobriat.vi					
X   X   X   X   X   X   X   X   X   X							
X X X		ExtendedKalmanFilter_New.vi					
		ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi					
X		ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Reset.vi ExtendedKalmanFilter_SetP.vi ExtendedKalmanFilter_SetXHat_Single.vi					
X		ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Reset.vi ExtendedKalmanFilter_SetP.vi					
X		ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Reset.vi ExtendedKalmanFilter_SetP.vi ExtendedKalmanFilter_SetXHat_Single.vi					
The state of the	st Routine	ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Reset.vi ExtendedKalmanFilter_SetP.vi ExtendedKalmanFilter_SetXHat_Single.vi ExtendedKalmanFilter_SetXHat.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
X X X X X X X X X X X X X X X X X X X	and opining Routine	ExtendedKalmanFilter_New.vi  ExtendedKalmanFilter_Predict.vi  ExtendedKalmanFilter_Reset.vi  ExtendedKalmanFilter_SetP.vi  ExtendedKalmanFilter_SetXHat_Single.vi  ExtendedKalmanFilter_SetXHat.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
X	Test Routine	ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Reset.vi ExtendedKalmanFilter_SetP.vi ExtendedKalmanFilter_SetXHat_Single.vi ExtendedKalmanFilter_SetXHat.vi	Function Prototype	Notes	Code Review	Test Program	
X	Test Routine	ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Reset.vi ExtendedKalmanFilter_SetP.vi ExtendedKalmanFilter_SetXHat_Single.vi ExtendedKalmanFilter_SetXHat.vi  VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK KalmanFilter_GetK_Single.vi	Function Prototype	Notes	Code Review	Test Program	
X	X Test Routine	ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Reset.vi ExtendedKalmanFilter_SetP.vi ExtendedKalmanFilter_SetXHat_Single.vi ExtendedKalmanFilter_SetXHat.vi  ExtendedKalmanFilter_SetXHat.vi  VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat	Function Prototype	Notes	Code Review	Test Program	
X	X Test Routine	ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Reset.vi ExtendedKalmanFilter_SetP.vi ExtendedKalmanFilter_SetXHat_Single.vi ExtendedKalmanFilter_SetXHat.vi  VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat_Single	Function Prototype	Notes	Code Review	Test Program	
X	X X X Test Routine	ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Reset.vi ExtendedKalmanFilter_SetP.vi ExtendedKalmanFilter_SetXHat_Single.vi ExtendedKalmanFilter_SetXHat.vi  VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_New.vi	Function Prototype	Notes	Code Review	Test Program	
X	X Test Routine	ExtendedKalmanFilter_New.vi ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Reset.vi ExtendedKalmanFilter_SetP.vi ExtendedKalmanFilter_SetXHat_Single.vi ExtendedKalmanFilter_SetXHat.vi  VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_New.vi KalmanFilter_New.vi KalmanFilter_Predict.vi	Function Prototype	Notes	Code Review	Test Program	
X	X X X Test Routine	ExtendedKalmanFilter_Predict.vi  ExtendedKalmanFilter_Reset.vi  ExtendedKalmanFilter_SetP.vi  ExtendedKalmanFilter_SetXHat_Single.vi  ExtendedKalmanFilter_SetXHat.vi   VI Name  KalmanFilter_Correct.vi  KalmanFilter_GetK  KalmanFilter_GetK  KalmanFilter_GetK_Single.vi  KalmanFilter_GetXHat  KalmanFilter_GetXHat  KalmanFilter_GetXHat  KalmanFilter_GetXHat  KalmanFilter_GetXHat  KalmanFilter_New.vi  KalmanFilter_New.vi  KalmanFilter_Reset.vi	Function Prototype	Notes	Code Review	Test Program	
X	X X X X X X X X X X X X X X X X X X X	ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Reset.vi ExtendedKalmanFilter_SetP.vi ExtendedKalmanFilter_SetXHat_Single.vi ExtendedKalmanFilter_SetXHat.vi  ExtendedKalmanFilter_SetXHat.vi  VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_New.vi KalmanFilter_New.vi KalmanFilter_Reset.vi KalmanFilter_Reset.vi KalmanFilter_SetXHat	Function Prototype	Notes	Code Review	Test Program	
X	X X X Test Routine	ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter_Reset.vi ExtendedKalmanFilter_SetP.vi ExtendedKalmanFilter_SetXHat_Single.vi ExtendedKalmanFilter_SetXHat.vi  VI Name KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_Reset.vi KalmanFilter_Reset.vi KalmanFilter_Reset.vi KalmanFilter_Reset.vi KalmanFilter_Reset.vi KalmanFilter_Reset.vi	Function Prototype	Notes	Code Review	Test Program	

FRC LabVIEW Trajectory Library – VI Implementation List							_				
Revision 2.X 5/2/2022 – added implicit model follower and time inte	rpolata	ble rou	itines.	pez							
$\sigma$	מ ו			ptimi	e gram				≥	E	ing
nente	entec	PILIB	ltem	ion O	Test Routine Sample Prog				Reviel	rograı	Sheck
прІете	Documente	Not WPILIB	Menu	Execution	Test Ro	VI Name	Function Prototype	Notes	ode l	estP	Error (
KALMAN FILTER LATENCY COMPENSATOR X			_ ≥   X	Щ	<u> </u>	KalmanFilterLatencyComp_AddObserverState.vi	Function Prototype	Notes	S		Щ
X			X			KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi					
X	X		X			KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.v					
X			X			KalmanFilterLatencyComp_FindClosestMeasurement.vi					
X			X			KalmanFilterLatencyComp_New.vi					
$\frac{x}{x}$			X			KalmanFilterLatencyComp_Observer_New.vi					
<u> </u>	X		X			KalmanFilterLatencyComp_Reset.vi					
Implemented	nted	817	Ę.	n Optimized	Routine Iple Program				eview	gram	ecking
9 9	cumente	Not WPILIB	Menu Item	Execution	Rou ple				e Re	Pro	ź
200 A	Doci	l Vot	len.	žec	Test Sam,	VI Name	Function Prototype	Notes	Sode	est	Erro
SWERVE DRIVE POSE ESTIMATOR			<b>&lt;</b>	<u> </u>		SwerveDrivePoseEst_AddVisionMeasurement_StdDev.vi	T dilotto i i i i i i i i i i i i i i i i i i	Notes			
X	X		X			SwerveDrivePoseEst_AddVisionMeasurement.vi					
X	<i>X</i>		X			SwerveDrivePoseEst_GetEstimatedPosition.vi					
X X			X			SwerveDrivePoseEst_Kalman_F_Callback.vi SwerveDrivePoseEst Kalman H Callback.vi					
X			X			SwerveDrivePoseEst_Kaiman_n_Cailback.vi					
X			X			SwerveDrivePoseEst ResetPosition.vi					
X			X			SwerveDrivePoseEst SetVisionMeasurementStdDevs.vi					
X	X		X			SwerveDrivePoseEst_Update.vi					
X			X			SwerveDrivePoseEst_UpdateWithTime.vi					
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 $oldsymbol{x}$			X			UnscentedKalmanFilter_Correct_FuncGroup.vi					
X			X			UnscentedKalmanFilter_Correct_OnlyUY.vi					
X X			X			UnscentedKalmanFilter_Correct_OnlyUYR.vi UnscentedKalmanFilter Correct.vi					
X			X			UnscentedKalmanFilter_GetP_Single.vi					
X			X			UnscentedKalmanFilter GetP.vi					
X			X			UnscentedKalmanFilter_GetXHat_Single.vi					
X			X			UnscentedKalmanFilter_GetXHat.vi					
<u>X</u>			X			UnscentedKalmanFilter_New_Default.vi					
<u>X</u>			X			UnscentedKalmanFilter_New_FuncGroup.vi UnscentedKalmanFilter New.vi					
X			X			UnscentedKalmanFilter_New.vi					
X			X			UnscentedKalmanFilter_Reset.vi					
X	X		X			UnscentedKalmanFilter_SetP.vi					
X			X			UnscentedKalmanFilter_SetXHat_Single.vi					
X			X			UnscentedKalmanFilter_SetXHat.vi					
X	X		X			UnscentedKalmanFilter_Transform.vi					

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Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines.

STATE SPACE CONTROL

CONTROL AFFINE PLANT INVERSION FEEDFORWARD	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized		VI Name Function Prototype	Notes	Code Review	Test Program	Error Checking
DIFFERENTIAL DRIVE ACCELERATION LIMITER	X X Implemented	Documented	Not WPILIB	X X Menu Item			VI Name Function Prototype  DiffDrvAccelLimit_Calculate.vi  DiffDrvAccelLimit_New.vi	Notes	Code Review	Test Program	Error Checking
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized		VI Name Function Prototype	Notes	Code Review	Test Program	Error Checking
IMPLICIT MODEL FOLLOWER				X X X X			ImplModelFollow_Calculate.vi ImplModelFollow_GetU.vi ImplModelFollow_GetU_Single.vi ImplModelFollow_New.vi ImplModelFollow_New_Plant.vi				
	X			X	)	(	ImplModelFollow_Reset.vi				
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized		VI Name Function Prototype	Notes	ode Review	est Program	rror Checking
LINEAR PLANT INVERSION FEEDFORWARD		X	_<_	X	Щ Н		LinearPIntInvFF_Calculate_NextR.vi LinearPIntInvFF_Calculate.vi	Notes			
	X	X		X			LinearPIntInvFF_GetR_Single.vi LinearPIntInvFF_GetR.vi				
	X	X		X			LinearPIntInvFF_GetUff_Single.vi LinearPIntInvFF_GetUff.vi				
	Χ	X		X			LinearPIntInvFF_New_Plant.vi LinearPIntInvFF_New.vi				
	X	X X		X			LinearPIntInvFF_Reset_Initial.vi LinearPIntInvFF_Reset_Zero.vi				
					g						
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimize		VI Name Function Prototype	Notes	Code Review	Test Program	Error Checking

FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time interpretations of the interpretation of the control of the control

2 – added implicit model follower and time	ınterp	olatab	le rout	ınes.
LINEAR QUADRATIC REGULATOR	Χ	X		Χ

me m	leipu	natabi	e routines.				
OR	X	Χ	X		LinearQuadraticRegulator_Calculate_NextR.vi		
	Χ	Χ	X		LinearQuadraticRegulator_Calculate.vi		
	Χ	Χ	X		LinearQuadraticRegulator_GetK_Single.vi	NOT ORIGINAL	
	X	Χ	X	Χ	LinearQuadraticRegulator_GetK.vi		
	X	Χ	X		LinearQuadraticRegulator_GetR_Single.vi		
	X	Χ	X		LinearQuadraticRegulator_GetR.vi		
	X	Χ	X		LinearQuadraticRegulator_GetU_Single.vi		
	Χ	Χ	X		LinearQuadraticRegulator_GetU.vi		
	/	Χ	X	Χ	LinearQuadraticRegulator_LatencyCompensate.vi	Routine exists, but it only has	
						interger raise matrix to power.	
	X	Χ	X		LinearQuadraticRegulator_New_ELMS.vi		
	X	Χ	X		LinearQuadraticRegulator_New_N.vi		
					LinearQuadraticRegulator_New_Raw.vi		
	X	Χ	X	Χ	LinearQuadraticRegulator_New_SystemELMS.vi		
	X	Χ	X		LinearQuadraticRegulator_New.vi		
	X	Χ	X		LinearQuadraticRegulator_Reset.vi		

	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimize	Test Routine	Sample Program	VI Name F	Function Prototype	Notes	Code Review	Test Program	Error Checking
LINEAR SYSTEM	Χ	X		Χ	- 1			LinearSystem_CalculateX.vi					
	Χ	X		X	- 1			LinearSystem_CalculateY.vi					
	Χ	Χ		Χ	SI			LinearSystem_GetA.vi					
	Χ	Χ		Χ	SI			LinearSystem_GetAElement.vi					
	Χ	Χ		Χ	SI			LinearSystem_GetB.vi					
	Χ	Χ		Χ	SI			LinearSystem_GetBElement.vi					
	Χ	Χ		Χ	SI			LinearSystem_GetC.vi					
	Χ	Χ		Χ	SI			LinearSystem_GetCElement.vi					
	Χ	Χ		Χ	SI			LinearSystem_GetD.vi					
	Χ	X		Χ	SI			LinearSystem_GetDElement.vi					
	Χ	X		Χ	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	Χ	Χ		Χ				LinearSystemLoop_ClampInput.vi					
	Χ	Χ		Χ				LinearSystemLoop_Correct.vi					
								LinearSystemLoop_GetClampFunction.vi					
	Χ	Χ		Χ				LinearSystemLoop_GetController.vi					
	Χ	Χ		Χ				LinearSystemLoop_GetError_Single.vi					
	Χ	Χ		Χ				LinearSystemLoop_GetError.vi					
	Χ	Χ		Χ				LinearSystemLoop_GetFeedForward.vi					
	Χ	Χ		Χ				LinearSystemLoop_GetNextR_Single.vi					
	Χ	Χ		Χ				LinearSystemLoop_GetNextR.vi					
	Χ	Χ		Χ				LinearSystemLoop_GetObserver.vi					
	Χ	Χ		Χ				LinearSystemLoop_GetU_Row.vi					
	Χ	Χ		Χ				LinearSystemLoop_GetU.vi					
	Χ	Χ		Χ				LinearSystemLoop_GetXHat_Single.vi					
	Χ	Χ		Χ				LinearSystemLoop_GetXHat.vi					
								LinearSystemLoop_New_BBB					
								LinearSystemLoop_New_LinearSystem_ClampFunc					
	Χ	Χ		Χ				LinearSystemLoop_New_LinearSystem_ClampVal.vi					
	Χ	Χ		Χ				LinearSystemLoop_New.vi					
	Χ	Χ		Χ				LinearSystemLoop_Predict.vi					
	X	X		X				LinearSystemLoop Reset.vi					

Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. LinearSystemLoop SetClampFunction.vi LinearSystemLoop\_SetNextR\_Some.vi X X Χ LinearSystemLoop\_SetNextR.vi LinearSystemLoop\_SetXHat\_Single.vi LinearSystemLoop SetXHat.vi Function Prototype Notes LTV DIFFERENTIAL DRIVE CONTROLLER X LTVDiffDriveCtrl Calculate.vi X LTVDiffDriveCtrl\_New.vi X X LTVDiffDriveCtrl\_Calculate\_TrajState.vi Χ Χ LTVDiffDriveCtrl\_Calculate\_SetTolerance.vi LTVDiffDriveCtrl\_Calculate\_AtReference.vi Χ Χ Function Prototype Notes LTV UNICYCLE CONTROLLER X LTVUnicycleCtrl AtReference.vi X X Χ LTVUnicycleCtrl\_Calculate\_Orig.vi This one computes a new LQR each time. Χ LTVUnicycleCtrl\_Calculate\_TrajState\_Orig.vi This one computes a new LQR Χ X X each time. Χ Χ X LTVUnicycleCtrl\_Calculate\_TrajState.vi LTVUnicycleCtrl\_Calculate.vi X X Χ Χ LTVUnicycleCtrl New.vi X X LTVUnicycleCtrl\_SetEnabled.vi X X Χ Χ X LTVUnicycleCtrl\_SetTolerance.vi '======== STATE SPACE UTILITIES '========= Not WPILIB Wenu Item Function Prototype Notes CALLBACK HELPER X Χ XX CallbackHelp MatrixMinus.vi X X XX CallbackHelp MatrixMult CoerceSizeB.vi CallbackHelp MatrixMult.vi X X X X  $X \mid X \mid X \mid X$ CallbackHelp MatrixPlus.vi

Function Prototype

Notes

DISCRETIZATION X X

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Discretization DiscretizeA.vi Discretization\_DiscretizeAB.vi Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. XX Discretization DiscretizeABTaylor.vi X X Χ Χ Discretization DiscretizeAQ.vi XX Χ X Discretization\_DiscretizeAQTaylor.vi XX Χ Discretization DiscretizeR.vi Notes Function Prototype STATE SPACE UTIL X X Χ No StateSpaceUtil Check Stabalizable.vi Internal routine StateSpaceUtil\_ClampInputMaxMagnitude.vi XX X Routine exists, it is just a shell X X StateSpaceUtil IsDetectable.vi X X StateSpaceUtil IsStabalizable.vi X X Χ StateSpaceUtil MakeCostMatrix.vi X X X Χ Χ StateSpaceUtil MakeCovarianceMatrix.vi X Χ Χ Χ Χ StateSpaceUtil MakeWhiteNoiseVector.vi X Χ StateSpaceUtil NomalizeInputVector.vi Χ Χ StateSpaceUtil\_PoseTo3dVector.vi Χ Χ X X Χ StateSpaceUtil PoseTo4dVector.vi XX Χ StateSpaceUtil PoseToVector.vi '----SIMULATION '======== Function Prototype Notes BATTERY SIM X SI BatterySim\_CalculateDefaultBatteryLoadedVoltage.vi X Χ X SI BatterySim\_CalculateLoadedVoltage.vi X X Function Prototype VI Name Notes DCMotorSim\_getAngularPositionRad.vi DCMotorSim\_getAngularPositionRotations.vi DC MOTOR SIM X X X X Χ X DCMotorSim getAngularVelocityRadPerSec.vi X X X X Χ DCMotorSim\_getAngularVelocityRPM.vi XX DCMotorSim GetCurrentDrawAmps.vi Χ DCMotorSim\_New\_MOI.vi X X X XX Χ DCMotorSim New Plant.vi XX Χ DCMotorSim SetInputVoltage.vi DCMotorSim Update.vi  $X \mid X$ Χ Menu Item Function Prototype Notes DIFFERENTIAL DRIVE TRAIN SIM X X DiffDriveTrainSim ClampInput.vi Χ

DiffDriveTrainSim\_CreateKitbotSim\_EstMass.vi
DiffDriveTrainSim\_CreateKitbotSim\_EstMassMOI.vi

	X	X		X				DiffDrive I rainSim_CreateKitbotSim_EstMassMOI.vi					
	X	Χ		Χ				DiffDriveTrainSim_CreateKitbotSim.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_GetCurrentDrawAmps.vi					
	X	Χ		Χ				DiffDriveTrainSim_GetCurrentGearing.vi					
	X	Χ		Χ				DiffDriveTrainSim_GetDynamics.vi					
	X	Χ		Χ				DiffDriveTrainSim_GetHeading.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi					
	X	X		X				DiffDriveTrainSim GetLeftPositionMeters.vi					
	X	X		X				DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_GetOutput_Single.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_GetPose.vi					
	X	Χ		Χ				DiffDriveTrainSim_GetRightCurrentDrawAmps.vi					
	X	Χ		Χ				DiffDriveTrainSim_GetRightPositionMeters.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi					
	X	X		X				DiffDriveTrainSim GetState Single.vi					
	X	X		X				DiffDriveTrainSim GetState.vi					
	X	$\frac{\lambda}{X}$		$\hat{X}$				DiffDriveTrainSim_GetState.vi					
	X	Χ		Χ				DiffDriveTrainSim_New_Mass_MOI.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_New.vi					
	Χ	Χ		Χ				DiffDriveTrainSim_SetCurrentGearing.vi					
	X	Χ		X				DiffDriveTrainSim_SetInputs.vi					
	X	Χ		Χ				DiffDriveTrainSim SetPose.vi					
	Χ	X		Χ				DiffDriveTrainSim SetState.vi					
	X	X		X				DiffDriveTrainSim ToughBoxMiniGearRatio.vi					
	X	X		X				DiffDriveTrainSim_ToughBoxMiniMotor.vi					
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ELEVATOR SIM	X	X	Not WI	X	Execut	Test Ro	Sample	ElevatorSim_GetCurrentDraw.vi ElevatorSim_GetPositionMeters.vi	Function Prototype	Notes	Code Re	Test Pro	Error Ch
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	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	X X X X X X X X X X X X X X X X X X X	Optimized			ElevatorSim_GetPositionMeters.vi  ElevatorSim_GetVelocityMetersPerSecond.vi  ElevatorSim_HasHitLowerLimit.vi  ElevatorSim_New_LinSys_NoNoise.vi  ElevatorSim_New_LinSys.vi  ElevatorSim_New_NoNoise.vi  ElevatorSim_New_NoNoise.vi  ElevatorSim_RKF45_Func.vi  ElevatorSim_SetInputVoltage.vi  ElevatorSim_SetState.vi  ElevatorSim_UpdateX.vi  ElevatorSim_UpdateX.vi  ElevatorSim_WouldHitLowerLimit.vi  ElevatorSim_WouldHitUpperLimit.vi  ElevatorSim_GetAngularVelocityRadPerSec.vi  FlyWheelSim_GetAngularVelocityRPM.vi  FlyWheelSim_GetCurrentDrawAmps		Needed because this doesn't extend.		Program	Checking
	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	X X X X X X X X X X X X X X X X X X X	Optimized			ElevatorSim_GetPositionMeters.vi  ElevatorSim_GetVelocityMetersPerSecond.vi  ElevatorSim_HasHitLowerLimit.vi  ElevatorSim_New_LinSys_NoNoise.vi  ElevatorSim_New_LinSys.vi  ElevatorSim_New_NoNoise.vi  ElevatorSim_New_NoNoise.vi  ElevatorSim_SetInputVoltage.vi  ElevatorSim_SetState.vi  ElevatorSim_UpdateX.vi  ElevatorSim_UpdateX.vi  ElevatorSim_WouldHitLowerLimit.vi  ElevatorSim_WouldHitUpperLimit.vi  ElevatorSim_GetAngularVelocityRadPerSec.vi  FlyWheelSim_GetAngularVelocityRPM.vi  FlyWheelSim_GetCurrentDrawAmps  FlyWheelSim_New_LinSys		Needed because this doesn't extend.  Notes  Future		Program	Checking
	X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X	X	X X X X X X X X X X X X X X X X X X X	Optimized			ElevatorSim_GetPositionMeters.vi  ElevatorSim_GetVelocityMetersPerSecond.vi  ElevatorSim_HasHitLowerLimit.vi  ElevatorSim_New_LinSys_NoNoise.vi  ElevatorSim_New_LinSys.vi  ElevatorSim_New_NoNoise.vi  ElevatorSim_New_NoNoise.vi  ElevatorSim_RKF45_Func.vi  ElevatorSim_SetInputVoltage.vi  ElevatorSim_SetState.vi  ElevatorSim_UpdateX.vi  ElevatorSim_UpdateX.vi  ElevatorSim_WouldHitLowerLimit.vi  ElevatorSim_WouldHitUpperLimit.vi  ElevatorSim_GetAngularVelocityRadPerSec.vi  FlyWheelSim_GetAngularVelocityRPM.vi  FlyWheelSim_GetCurrentDrawAmps		Needed because this doesn't extend.		Program	Checking

	Library – VI Implementation List						
Revision 2.X 5/2/2022 – adde	ed implicit model follower and time interpolatable routines.	FlyWheelSim_New_LinSys_NoNoise		Future			
	X X X	FlyWheelSim_New_MOI.vi		i didic			
	X X X	FlyWheelSim_SetInput.vi					
	X X X	FlyWheelSim_SetState.vi					
	X X X	FlyWheelSim_Update.vi					
	Company   Comp	VI Name  LinearSystemSim_ClampInput.vi  LinearSystemSim_GetCurrentDrawAmps.vi  LinearSystemSim_GetOutput_Single.vi  LinearSystemSim_New  LinearSystemSim_New_NoNoise.vi  LinearSystemSim_SetInput_Array.vi  LinearSystemSim_SetInput_Single.vi  LinearSystemSim_SetInput_Single.vi  LinearSystemSim_SetInput_Single.vi  LinearSystemSim_SetInput_Vi  LinearSystemSim_SetInput_vi	Function Prototype	Notes  DONT IMPLEMENT  Doesn't use clamp ?	Code Review	Test Program	Error Checking
	X   X   X   X   X   X   X   No	LinearSystemSim_Update.vi LinearSystemSim_UpdateX.vi				<del></del>	<del></del>
	X X X No	LinearSystemSim_UpdateY.vi					
	SINGLE JOINT ARM SIM	SngJntArmSim_EsitmateMOI.vi SngJntArmSim_EsitmateMOI.vi SngJntArmSim_GetAngleRads.vi SngJntArmSim_GetCurrentDraw.vi SngJntArmSim_GetVelocityRadsPerSec.vi SngJntArmSim_HasHitLowerLimit.vi SngJntArmSim_HasHitUpperLimit.vi SngJntArmSim_New.vi SngJntArmSim_New.vi SngJntArmSim_SetInputVoltage.vi SngJntArmSim_SetState.vi SngJntArmSim_Update.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	X   X   X   X   X   X   X   X   X   X	SngJntArmSim_UpdateX.vi SngJntArmSim_WouldHitLowerLimit.vi SngJntArmSim_WouldHitUpperLimit.vi					
'====== MATRIX UTILITIES '=========	X X X	SngJntArmSim_WouldHitLowerLimit.vi	,				
MATRIX UTILITIES	X X X	SngJntArmSim_WouldHitLowerLimit.vi SngJntArmSim_WouldHitUpperLimit.vi  Water State of State o	Function Prototype	Notes	Code Review	Test Program	Error Checking

Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. VI Name Function Prototype Notes MATRIX Χ X Χ SI Matrix AssignBlock.vi X SI Matrix Block.vi Matrix\_ChangeBoundsUnchecked.vi XX X SI Matrix Create.vi Matrix Det.vi X X X SI Matrix Diag.vi labview has function Matrix Div Scalar.vi Matrix\_ElementPower.vi XX X SI Matrix ElementSum.vi Matrix ElementTimes.vi Matrix Equals.vi XX XI Matrix Exp.vi XX X SI Matrix\_ExtractColumnVector.vi XX X SI Matrix ExtractFrom.vi Matrix ExtractMatrix.vi X X X SI Matrix ExtractRowVector.vi Matrix Fill.vi XX X SI Matrix\_Get.vi labview has function XX X Matrix Ident.vi WPILIB calls this EYE Matrix Inv.vi Χ X SI Matrix IsEqual.vi X Matrix IsIdentical.vi XX XI Matrix\_LLTDecompose.vi Matrix\_Max.vi Matrix MaxAbs.vi Matrix Mean.vi Matrix MinInternal.vi Matrix Minus Matrix.vi Matrix Minus Scalar.vi XX Matrix NormF.vi XI Matrix NormIndP1.vi Matrix Plus Matrix.vi Matrix Plus Scalar.vi XX XI THIS NEEDS WORK!!!! Matrix Pow.vi X X X SI Matrix\_SetColumn.vi XX X SI THERE ARE LOTS OF OTHER MATRIX FUNCTIONS THAT Matrix\_SetRow.vi SHOULD BE INCLUDED HERE FOR ISOLATION. Matrix Solve.vi Matrix Times Matrix.vi Matrix Times Scalar.vi Matrix Trace.vi XX X SI Matrix\_Transpose.vi X XX Matrix WithinTolerance.vi VI Name Function Prototype SIMPLE MATRIX X NOTE Matrix also has an SimpleMatrix ExtractMatrix.vi ExtractMatrix with different calling parameters.... YUK.

FRC LabVIEW Trajectory Library – VI Implementation List
Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines.

odel lollower and time il	nierpo	iatabi	e routi	mes.	_							
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimizea	Test Routine	 VI Name	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATRIX HELPER	X	X	X	X	SI		MatrixHelper_CooerceSize.vi					
	Χ	Χ	Χ	Χ	SI		MatrixHelper_MultCooerceBSize.vi					
	Χ	Χ	Χ	Χ	SI		MatrixHelper_Zero.vi					

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

'========

MATH '========

ANGLE STATISTICS		X Documented	X Not WPILIB		X Execution Optimized	Test Routine	ଞ୍ଚିତ୍ର ଆଧିକ ଆଧିକ ଆଧିକ W VI Name  AngleStats_AngleAdd_CallbackHelp.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
	Χ	Χ		X	I	X	AngleStats_AngleAdd.vi					
	Χ	X	X	X	X		AngleStats_AngleMean_CallbackHelp.vi					
	Χ	X		X	- 1	X	AngleStats_AngleMean.vi					
-	Χ	X	X	X	X		AngleStats_AngleResidual_CallbackHelp.vi					
-	Χ	X		X		X	AngleStats_AngleResidual.vi					
	Implemented	Documented	Not WPILIB	Menu Item	Execution Optimized	Test Routine	Nample Program	Function Prototype	Notes	Code Review	Test Program	Error Checking
MATH UTILITY	Χ	X		X	SI		MathUtil_AngleModulus.vi					
	X	X		X	SI		MathUtil_ApplyDeadband.vi					
	Χ	X		X	SI		MathUtil_Clamp_Int.vi					
	Χ	X		X	SI		MathUtil_Clamp.vi					
	Χ	X		X	SI		MathUtil_InputModulus.vi					
	Χ	X		X	Si		MathUtil_Interpolate.vi					

FRC LabVIEW Trajectory Library – VI Implementation List
Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines.

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	Implementea	ente	Not WPILIB	,em				PA			evie	Program	hec
	lem	Documen	Ŋ	Menu Item		Execution Test Routi	:	NI Name			ð R	÷ P	
	lmp	Doc	Not	Me		Exec Test	3	VI Name	Function Prototype	Notes	Cod	Test	Error
MERWE SCALED SIGMA POINTS		X		X		1		MerweScSigPts_ComputeWeights.vi	* *				
	X					SI		MerweScSigPts_GetNumSigmas.vi				-	
	X			X	,	SI SI	+	MerweScSigPts_GetWc_Single.vi MerweScSigPts_GetWc.vi					
	X	X		$\frac{1}{X}$		SI		MerweScSigPts_GetWm_Single.vi					
	X			X		SI		MerweScSigPts_GetWm.vi					-
	X			X		1		MerweScSigPts_New_Default.vi					ı
	X	X		X		1		MerweScSigPts_New.vi MerweScSigPts_SigmaPoints.vi					
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					;	tin Tin		Program				~	б
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	mer	nen	Į.	lter		itior Sou	5	A H			Rei	709	Checking
	mplemented	Documente	Not WPILIE	Menu Item		Execution Op Test Routine		Name Salah			эде	Test Program	Error
NUMERICAL INTEGRATION				∑		<u> </u>	<u>'</u>		Function Prototype	Notes  NOT USED. Should this be used	<u>Ğ</u>		<u> </u>
NUMERICAL INTEGRATION	^	^				'		NumIntegrate_Func_Ax_Bu_K.vi		or abandoned???	İ		ı
	X			X				NumIntegrate_Rk4_Dbl_X_U.vi					
	X	X		X	·		-	NumIntegrate_Rk4_Dbl_X.vi NumIntegrate_Rk4_Mat_X_U.vi					i
	X			$\frac{\lambda}{X}$	-		+	NumIntegrate_Rk4_Mat_X_0.vi					
	X	X		No	o ,	SI		NumIntegrate_Rkdp_Func_A.vi					
	X			No	ο .	SI		NumIntegrate_Rkdp_Func_B1.vi					
	X			No No		SI SI	+	NumIntegrate_Rkdp_Func_B1B2.vi NumIntegrate_Rkdp_Func_B2.vi					<u> </u>
	$\hat{X}$			No	, ,	1	+	Numintegrate_Rkdp_Impl.vi					
	X	X		X				NumIntegrate_RKDP_Mat_X_U.vi		New replacement for RKF45			
	X			No	) ,	SI		NumIntegrate_Rkf45_Func_A.vi			<del> </del>		
	X			No No		SI SI		NumIntegrate_Rkf45_Func_B1.vi NumIntegrate_Rkf45_Func_B1B2.vi					
	$\frac{\hat{x}}{X}$					SI	+	NumIntegrate Rkf45 Func B2.vi					
								NumIntegrate_RKf45_Func_Bs.vi		Removed. Replaced with newer			
								NumIntegrate_RKf45_Func_Ch.vi		functions.  Removed. Replaced with newer			
										functions.			I
								NumIntegrate_RKf45_Func_Ct.vi		Removed. Replaced with newer	İ		ı
	X	X		No	,	1	+	NumIntegrate_Rkf45_Impl.vi		functions.			
	X	X		X				NumIntegrate_Rkf45_Mat_X_U.vi		Note that this Feinberg method has			
										been changed and a Ďormand Price method has been	İ		ı
										implemented TODO			
				, ,		01		NumIntegrate_RKf45_New.vi		Removed. Never used.			
	X	X	X	X	,	SI I	_	NumIntegrate_Trap_Dbl.vi NumIntegrate Trap Mat.vi					
			\ \ \ \ \ \	^		<u>'</u>		Nummegrate_frap_wat.vi					
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						zeq							
					,	tini.		am				_	ō
	ted	pə,	ø	۰ ا		o e	)	Program			iew	ram	Checking
	nen	neni	PIL	Iten	,	tion of	5	<del>о</del>			Revi	rog	She
	Implementea	Document	Vot WPILIB	Menu Item		Execution Op Test Routine	5	Name VI Name			Code I	Test Program	Error (
						Ď, Ŭ	. ,		Function Prototype	Notes	ပိ		En
RUNGE KUTTA TIME VARYING	X	X		No	2		$\perp$	RungeKuttaTimeVarying_RK4_Mat_T_Y.vi			<u> </u>		i
	1				- 1						(	1	

Revision 2.X 5/2/2022 – a	dded implicit model follower and time	e interp	olatable	routin	es.				_				
	NUMERICAL JACOBIAN	X   X   Implemented			X Menu Item	Execution Optimized	Test Routine Sample Program	VI Name    NumJacobian_U.vi     NumJacobian_X.vi	Function Prototype	Notes	Code Review	Test Program	Error Checking
'====== VISION '=========	RICCAT	X X X X	X X X	X X	X X X X X X X X X X X X X X X X X X X		X X Test Routine Sample Program	VI Name  Riccati_Check_Detectable.vi  Riccati_Check_Stabilizable.vi  Riccati_DARE_Iterate.vi  Riccati_DARE_StructDoubling.vi  Riccati_DARE_N.vi  Riccati_DARE.vi  Riccati_Input_Check.vi	Function Prototype	Notes Routine exists, it is just a shell Not really done !!!	Code Review	Test Program	Error Checking
	COMPUTER VISION UTILITIES	X X X	X X X		X Wenu Item	Execution Optimized	Test Routine Sample Program		Function Prototype	Notes	Code Review	Test Program	Error Checking
'====== TYPE DEFINITIONS '=========						77							
	ТуреDe	Z	X X X	X	X	N/A	Test Routine Sample Program	VI Name  ARM_FF.CTL  BANG_BANG.CTL  BICon-Matrix_FUNC_TYPE.CTL  CALLBACK_FUNC_TYPE.CTL  CHASSIS_SPEEDS.CTL  CONTRAINED_STATE.CTL  DCMOTOR_TYPES_ENUM.CTL  DCMOTOR.CTL  DCMOTOR_SIM.CTL	Function Prototype	Notes  NOT USED. Should this be deleted or abandoned???	Code Review	Test Program	Error Checking

ime interpo	olatab	le rout	ines.			
Z	Χ	X		N/A	DEBOUNCER TYPE ENUM.Ctl	
Z	Χ	Χ		N/A	DEBOUNCER.CTL DEBOUNCER.CTL	
Z	Χ	Χ		N/A	DIFF DRIVE ACCEL LIMIT.CTL	
Z	Χ	Χ	Χ	N/A	DIFF DRIVE KINEMATICS.CTL	
Z	Χ	Χ	Χ	N/A	DIFF_DRIVE_Kitbot_WheelSize_ENUM.ctl	
Z	Χ	Χ	Χ	N/A	DIFF DRIVE Pose EST.ctl	
Z	Χ	Χ	Χ	N/A	DIFF_DRIVE_ToughBoxMini_GearChoice_ENUM.ctl	
Z	Χ	Χ	Χ	N/A	DIFF_DRIVE_ToughBoxMini_MotorChoice_ENUM.ctl	
Z	Χ	Χ	Χ	N/A	DIFF DRIVE TRAIN SIM STATE ENUM.CTL	
Z	Χ	Χ	Χ	N/A	DIFF_DRIVE_TRAIN_SIM.ctl	
Z	Χ	Χ	Χ	NA	DISPLAY_WAYPOINT.ctl	Was UTIL_WAYPOINT.VI
Z	Χ	Χ	Χ	NA	DISPLAY_WEIGHTED_WAYPOINT.ctl	New V1.5. was
						UTIL_WEIGHTED_WAYPOINIT.VI
Z	X	X		N/A	ELEV_FF.CTL	
Z	X	X	Χ	N/A	ELEVATOR_SIM.CTL	
Z	Χ	X		N/A	EXTENDED_KALMAN_CORRECT_FUNC_GROUP.CTL	
Ζ		X		N/A	ExTENDED_KALMAN_FILTER.CTL	
Z	X	X	Χ	N/A	FLYWHEEL_SIM.ctl	
Z	X	X		N/A	FUNCTION_GENERATOR.ctl	
Z	Χ	X	Χ	N/A	FUNCTION_GENERATOR_MATRIX.ctl	
Z	Χ	Χ	X	N/A	HOLONOMIC_DRV_CTRL.CTL	New 1/26/21
Z	X	X	Χ	N/A	TIME_INTERPOLATABLE_BOOLEAN.CTL	
Z	X	X	Χ	N/A	TIME_INTERPOLATABLE_DOUBLE.CTL	
Z	Χ	X	Χ	N/A	TIME_INTERPOLATABLE_POSE2D.CTL	
Z	Χ	X	Χ	N/A	TIME_INTERPOLATABLE_ROTATION2D.CTL	
Z	Χ	Χ		N/A	KALMAN_FILTER_LATENCY_COMP_FUNC_GROUP.CTL	
Z	X	X	X	N/A	KALMAN_FILTER_LATENCY_COMP.CTL	
Z	X	X	Χ	N/A	KALMAN_FILTER.ctl	
Z	Χ	X		N/A	LINEAR_FILTER.CTL	
Z	Χ	Χ	Χ	N/A	LINEAR_PLANT_INV_FF.ctl	
Z	Χ	Χ	Χ	N/A	LINEAR_QUADRATIC_REGULATOR.ctl	
Z	Χ	Χ	Χ	N/A	LINEAR_SYSTEM_LOOP.ctl	
Z	Χ	Χ	Χ	N/A	LINEAR_SYSTEM_SIM.ctl	
Z	Χ	Χ	Χ	N/A	LINEAR_SYSTEM.ctl	
Z		Χ	Χ	N/A	LTV_DIFF_DRIVE_CTRL.ctl	
Z		Χ	Χ	N/A	LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl	
Z		Χ	Χ	N/A	LTV UNICYCLE CONTROLLER.CTL	
Ζ		X	X	N/A	LTV UNICYCLE CONTROLLER INPUT ENUM.ctl	
Z		Χ	Χ	N/A	LTV UNICYCLE CONTROLLER STATE ENUM.ctl	
Z	Χ	Χ		N/A	MECA DRIVE KINEMATICS.CTL	
Z	Χ	Χ	Χ	N/A	MECA_DRIVE_ODOMETRY.CTL	
Z	Χ	Χ	Χ	N/A	MECA WHEEL SPEEDS.CTL	
Z	Χ	Χ	Χ	N/A	MEDIAN FILTER.CTL	
Z	Χ	Χ	Χ	N/A	MERWE SCALED SIGMA PTS.ctl	
Z	Χ	X		N/A	OBSERVER SNAP LIST ITEM.CTL	
Z	Χ	Χ		N/A	OBSERVER SNAPSHOT.CTL	
Z	Χ	Χ	Χ	N/A	PARAM STACK ITEM.CTL	
Z	Χ	Χ		N/A	PARAM STACK.CTL	
Z	Χ	Χ		N/A	PID_ADV_LIMITS.CTL	
Z	Χ	Χ	Χ	N/A	PID ADV TUNING.CTL	
Z	Χ	Χ	Χ	N/A	PID CONTROLLER.CTL	
Z	Χ	Χ		N/A	PID ERROR TOLERANCE.CTL	
Z	Χ	X		N/A	PID INPUT LIMITS.CTL	
Z	X	X		N/A	PID TUNING.CTL	
Z	Χ	X		N/A	POSE2D.CTL	
Z		X		N/A	POSE3D.CTL	
Z	Χ	X		N/A	POSEWCURVATURE.CTL	
Z	X	X		N/A	PROFILED PID CONTROLLER.CTL	
Z		X		N/A	QUATERNION.CTL	
Z	Χ	X		N/A	RAMSETE EXE TUNING.CTL	
Z	X	X	X	N/A	RAMSETE.CTL	
Z	X	X		N/A	ROTATION2D.CTL	
Z		X		N/A	ROTATION3D.CTL	
Z	Χ	X	X	N/A	SIMPLE MOTOR FF.CTL	
Z	X	X		N/A	SINGLE JOINT ARM SIM.CTL	
Z	X	X		N/A	SLEW RATE LIMITER.CTL	
				• 1		

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interpolatable routines.						
Z	Χ	Χ	Χ	N/A	SPLINE_CTRL_VECTOR.CTL	
Z	Χ	Χ	Χ	N/A	SPLINE.CTL	
Z	Χ	X	X	N/A	SWERVE_DRIVE_KINEMATICS.CTL	
Z	Χ	Χ	Χ	N/A	SWERVE_DRIVE_MODULE_STATE.CTL	
Z	Χ	Χ	Χ	N/A	SWERVE_DRIVE_ODOMETRY.CTL	
Z	Χ	Χ	Χ	N/A	SWERVE_DRIVE_Pose_EST.CTL	
Z	Χ	Χ	Χ	N/A	TIMER.CTL	
Z	Χ	Χ	Χ	N/A	TRAJ_CONFIG.CTL	
Z	Χ	Χ	Χ	N/A	TRAJ_CONSTRAINT_CENTRIPETAL_ACCEL.CTL	
Z	Χ	Χ	Χ	N/A	TRAJ_CONSTRAINT_DIIF_DRIVE_KINEMATICS.CTL	
Z	Χ	Χ	Χ	N/A	TRAJ_CONSTRAINT_DIIF_DRIVE_VOLTAGE.CTL	
1		Χ		N/A	TRAJ_CONSTRAINT_JERK.CTL	Routine exists, it is just a shell
Z	Χ	Χ	Χ	N/A	TRAJ_CONSTRAINT_MECA_DRIVE_KINEMATICS.CTL	
Z	X	Χ	X	N/A	TRAJ_CONSTRAINT_MINMAX.CTL	
Z	X	Χ	X	N/A	TRAJ_CONSTRAINT_SWERVE_DRIVE_KINEMATICS.CTL	
Ζ	X	Χ	Χ	N/A	TRAJ_STATE.CTL	
Ζ	Χ	Χ	Χ	N/A	TRAJECTORY_SPLINE_TYPE_ENUM.CTL	
Ζ	X	Χ	Χ	N/A	TRAJECTORY.CTL	
Ζ	X	Χ	Χ	N/A	TRANSFORM2D.CTL	
Ζ		X	X	N/A	TRANSFORM3D.CTL	
Z	X	Χ	X	N/A	TRANSLATION2D.CTL	
Z		Χ	Χ	N/A	TRANSLATION3D.CTL	
Z	X	Χ	X	N/A	TRAPEZOID_PROFILE_CONSTRAINT.CTL	
Z	X	Χ	X	N/A	TRAPEZOID_PROFILE_STATE.CTL	
Z	X	Χ	X	N/A	TRAPEZOID_PROFILE.CTL	
Z	X	Χ	X	N/A	TWIST2D.CTL	
Ζ		Χ	X	N/A	TWIST3D.CTL	
Z	Χ	X	X	N/A	UNSCENTED_KALMAN_CORRECT_FUNC_GROUP.CTL	
Z	Χ	Χ	Χ	N/A	UNSCENTED_KALMAN_FILTER.ctl	
Z	Χ	Χ	Χ	N/A	UNSCENTED_KALMAN_NEW_FUNC_GROUP.CTL	
Ζ	Χ	Χ	Χ	N/A	UTIL_PATHFINDER_CONFIG.CTL	
N/A		N/A		N/A	WAYPOINTS.CTL	Delete – obsolete
Ζ	Χ	Χ	Χ	NA	WEIGHTED_WAYPOINT.CTL	New V1.5
N/A		N/A		N/A	X_Y_HEADINGS.CTL	Delete – obsolete
Ζ	Χ	Χ	Χ	N/A	X_Y_PAIR.CTL	

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