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 94.75% Optimization Pct 55.91%

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

'===== BASE

BASE '=======

| ANALOG DELAY | X Implemented X Documented X Not WPILIB | X Menu Item | - Execution Optimized Test Routine | S VI Name AnalogDelay.vi | Function Prototy | | s Sar to interpolated tree map | T. | rest Program | Error Checking |
|--------------------------|--|---------------|-------------------------------------|---|------------------|---------|---|------------------|--------------|----------------|
| | Implemented Documented Not WPILIB | | Execution Optimized Test Routine | | Function Prototy | | | 2000 | 7 | Error Checking |
| FUNCTION GENERATO | | X | 1 | FunctionGenerator_Add_Value.vi | | | ar to interpolated tree map | | | |
| | XX | X | 1 | FunctionGenerator_Add_XY.vi | | | ar to interpolated tree map | | | |
| | X X X | X | SI | FunctionGenerator_Calculate.vi FunctionGenerator Clear.vi | | Simi | ar to interpolated tree map | | | |
| | $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | 1 | FunctionGenerator Execute.vi | | Simi | ar to interpolated tree map | | | |
| | $\begin{array}{ c c c c c c c c c c c c c c c c c c c$ | $\frac{1}{X}$ | SI | FunctionGenerator_New.vi | | | ar to interpolated tree map | | | |
| | Implemented Documented Not WPILIB | Menu Item | Execution Optimized Test Routine | | Function Prototy | oe Note | | Total Discussion | | Error Checking |
| FUNCTION GENERATOR MATRI | | | 1 | FunctionGeneratoMatrixr_Add.vi | | | ar to interpolated tree map | | | |
| | X X X X X X X X X X | X | SI | FunctionGenerator_Calculate.vi FunctionGenerator New.vi | | | ar to interpolated tree map ar to interpolated tree map | | | |
| | XXX | X | 31 | FunctionGenerator_New.vi | | Simi | ar to interpolated tree map | | | |
| | Implemented Documented Not WPILIB | Menu Item | Execution Optimized Test Routine | Sample Program | Function Prototy | oe Note | s Code Review | 7.000 | ž | Error Checking |

FRC LabVIEW Trajectory Library – VI Implementation List

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

LINEAR FILTER X X X I LinearFilter BackwardFiniteDiffe

| LINEAR FILTER | X | | | Χ | 1 | | | LinearFilter_BackwardFiniteDifference.vi | | | | | |
|------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|-------------------------|--------------|---------------------------------------|--|--------------------|---|-------------|--------------|----------------|
| | Χ | Χ | | Χ | SI | | | LinearFilter_Calculate.vi | | | | | |
| | Χ | Χ | Χ | Χ | | | | LinearFilter_CutoffFrequency.vi | | | | | |
| | X | X | X | X | 1 | | X | LinearFilter_Execute.vi | | Labview style helper | | | |
| | X | X | | No | 1 | | | LinearFilter_Factorial.vi | | AN INTERNAL ROUTINE | | | |
| | X | X | | X | I X | | | LinearFilter_FiniteDifference.vi LinearFilter_HighPass.vi | | | | | |
| | X | | Χ | X | X | | | LinearFilter HighPassBW1.vi | | | | | |
| | X | X | X | X | X | | | LinearFilter_HighPassBW2.vi | | | | | |
| | X | X | X | X | X | | | LinearFilter_LowPassBW1.vi | | | | | |
| | X | | X | X | X | | | LinearFilter LowPassBW2.vi | | | | | |
| | Χ | X | | Χ | Х | | | LinearFilter_MovingAverage.vi | | | | | |
| | Χ | Χ | | Χ | - 1 | | | LinearFilter_New.vi | | | | | |
| | Χ | Χ | | Χ | SI | | | LinearFilter_Reset.vi | | | | | |
| | Χ | | Χ | Χ | SI | | | LinearFilter_ResetToValue.vi | | | | | |
| | Χ | Χ | | Χ | Χ | | | LinearFilter_SinglePoleIIR.vi | | | | | |
| | Χ | Χ | Χ | Χ | Χ | | | LinearFilter_TimeConst.vi | | | | | |
| MEDIAN FILTER | X Implemented | X Documented | Not WPILIB | X Menu Item | X Execution Optimized | Test Routine | Sample Program | VI Name MedianFilter Calculate.vi | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| | X | | Χ | X | 1 | | X | MedianFilter Execute.vi | | Labview style helper | | | |
| | Χ | X | | Χ | SI | | | MedianFilter New.vi | | , , | | | |
| | Χ | Χ | | Χ | SI | | | MedianFilter_Reset.vi | | | | | |
| | Χ | Χ | Χ | Χ | SI | | | MedianFilter_ResetToValue.vi | | | | | |
| SLEW RATE FILTER | X | X X Documented | X X Not WPILIB | X X Menu Item | S Execution Optimized | Test Routine | | VI Name SlewRateLimiter_Calculate.vi SlewRateLimiter_Close.vi SlewRateLimiter_Execute.vi | Function Prototype | Notes Labview style helper | Code Review | Test Program | Error Checking |
| | X X X X | X X X X | X | X X X X | I I SI | | | SlewRateLimiter_GetRate.vi SlewRateLimiter_New.vi SlewRateLimiter_NewInitialZero.vi SlewRateLimiter_Reset.vi SlewRateLimiter_SetRate.vi | | | | | |
| TIMER | X X X X X X X X X X X X X X X X X X X | X X X X X X X X X X X X X X X X X 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 | X X X X X X X X X X X X X X X X X X X | SlewRateLimiter_New.vi SlewRateLimiter_Reset.vi SlewRateLimiter_SetRate.vi SlewRateLimiter_SetRate.vi VI Name Timer_Close.vi Timer_Get.vi Timer_GetAndReset.vi Timer_GetInternal.vi Timer_HasPeriodPassedOnce.vi Timer_New.vi Timer_Reset.vi Timer_Reset.vi Timer_Reset.vi Timer_Reset.vi | Function Prototype | Notes releases semaphore Internal (private) only | Code Review | Test Program | Error Checking |
| TIMER | X X X X X X X X X X X X X X X X X X X | X X X X X X X X X X X X X X X X X X X | X 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 92 | Test Routine | X X X X X X X X X X X X X X X X X X X | SlewRateLimiter_New.vi SlewRateLimiter_Reset.vi SlewRateLimiter_SetRate.vi SlewRateLimiter_SetRate.vi VI Name Timer_Close.vi Timer_Get.vi Timer_GetAndReset.vi Timer_GetInternal.vi Timer_HasPeriodPassed.vi Timer_HasPeriodPassedOnce.vi Timer_New.vi Timer_Reset.vi Timer_Reset.vi Timer_Reset.vi Timer_Reset.vi Timer_Reset.vi | Function Prototype | Internal (private) only | Code Review | Test Program | Error Checking |
| TIMER | X X X X X X X X X X X X X X X X X X X | X X X X X X X X X X X X X X X X X X X | X X X X X X X X X X X X X X 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 92 | Test Routine | X X X X X X X X X X X X X X X X X X X | SlewRateLimiter_New.vi SlewRateLimiter_Reset.vi SlewRateLimiter_SetRate.vi SlewRateLimiter_SetRate.vi VI Name Timer_Close.vi Timer_Get.vi Timer_GetAndReset.vi Timer_GetInternal.vi Timer_HasPeriodPassedOnce.vi Timer_New.vi Timer_Reset.vi Timer_Reset.vi Timer_Reset.vi Timer_Reset.vi | Function Prototype | Internal (private) only | 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.

| 2/2022 – added implicit model follower and time i | nterpola | able rol | utines | • | | | | | | | | |
|---|-----------------|----------------|-------------------|-----------------------|-----|----------------|--|--------------------|---|-------------|--------------|----------------|
| TIME INTERPOLATABLE BOOLEAN | X X Implemented | X X Not WPILIB | X | 1 | | Sample Program | VI Name TimeInterpBoolean_AddSample.vi TimeInterpBoolean_CleanUp.vi | Function Prototype | Notes Update to use create matrix Update to use create matrix | Code Review | Test Program | Error Checking |
| | X X | \ X | X | SI | | | TimeInterpBoolean_Clean.vi | | opuate to use create matrix | | | |
| | $X \mid X$ | (X | X | 1 | | | TimeInterpBoolean_GetSample.vi | | | | | |
| - | X X X | (X (X | $\frac{X}{X}$ | SI | | | TimeInterpBoolean_New.vi TimeInterpBoolean_SetMaxTime.vi | | | | | |
| | X | | X No X X | | | Sample Program | VI Name TimeInterpDouble_AddSample.vi TimeInterpDouble_CleanUp.vi TimeInterpDouble_Clear.vi TimeInterpDouble_GetSample.vi TimeInterpDouble_New.vi TimeInterpDouble_SetMaxTime.vi | Function Prototype | Notes Update to use create matrix Update to use create matrix | Code Review | Test Program | Error Checking |
| TIME INTERPOLATABLE POSE2D | X X X | Not WPILIB | No X | $\overline{1}$ | | Sample Program | VI Name TimeInterpPose2d_AddSample.vi TimeInterpPose2d_CleanUp.vi TimeInterpPose2d_Clear.vi TimeInterpPose2d_GetSample.vi | Function Prototype | Notes Update to use create matrix Update to use create matrix | Code Review | Test Program | Error Checking |
| | X X X | (X (X | X | SI | | | TimeInterpPose2d_New.vi TimeInterpPose2d_SetMaxTime.vi | | | | | |
| TIME INTERPOLATABLE ROTATION2D | X Implemented | X Not WPILIB | X Menu Item | - Execution Optimized | | Sample Program | VI Name TimeInterpRotation2d_AddSample.vi | Function Prototype | Notes Update to use create matrix | Code Review | Test Program | Error Checking |
| | X | (X (X | No | SI | | | TimeInterpRotation2d_CleanUp.vi TimeInterpRotation2d_Clear.vi | | Update to use create matrix | | | |
| | X | (X | X | 1 | | | TimeInterpRotation2d_GetSample.vi | | | | | |
| | X | (X (X | X | SI | | | TimeInterpRotation2d_New.vi TimeInterpRotation2d_SetMaxTime.vi | | | | | |
| | Implemented | Not WPILIB | Menu Item | Optimized | .ue | | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| | | (X | X | | | | DigSeqLogic_Delay.vi | | | | | |
| L | X | <i>X</i> | X | | | | DigSeqLogic_On_Delay.vi | | | | | |

FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. XXXX DigSeqLogic_Off_Delay.vi X X X X DigSeqLogic_One_Shot.vi X X X X DigSeqLogic_SR_Flip_Flop.vi Execution Optimized VI Name Function Prototype Notes DEBOUNCER X X Χ Debouncer New.vi Χ Χ Χ Debouncer Calculate.vi XX Debouncer Execute.vi XX XX No Debouncer_Reset.vi Χ No Debouncer HasElapsed.vi X '======== CONTROLLER '======== Menu Item Function Prototype Notes ARM FF X X X ArmFF Calculate.vi ArmFF CalculateVelocityOnly.vi XX X ArmFF Execute.vi LabVIEW style single call X ArmFF_ExecuteVelocityOnly.vi LabVIEW style single call X Χ ArmFF_MaxAchieveAccel.vi X X X X X Χ Χ ArmFF_MaxAchieveVelocity.vi ArmFF MinAchieveAccel.vi X X X ArmFF MinAchieveVelocity.vi X X ArmFF New ZeroGravity.vi X Χ XX X ArmFF New.vi Execution Optimized Menu Item VI Name Function Prototype Notes BANG BANG X X Χ SI BangBang AtSetpoint.vi X X X SI BangBang_Calculate_PV.vi BangBang_Calculate_SP_PV.vi XX X SI Χ X X X SI BangBang_Execute.vi BangBang_GetAll.vi Χ X SI X Χ X SI BangBang_GetError.vi X Χ X SI BangBang_New.vi X Χ X SI Χ BangBang_SetSetpoint.vi Χ X X SI BangBang SetTolerance.vi Execution Optimized Test Program rest 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 interpolatable routines.

| CONTROLLER UTIL | V | X | | X | | | | | | | | | |
|-----------------|---------------------------------------|---------------------------------------|----------------|---------------------------------------|--|--------------|---------------------------------------|--|--------------------|---|-------------|--------------|----------------|
| | ^ | | | ^ | SI | | | ControllerUtil_GetModulusError.vi | | This was short lived in WPILIB, but still useful here. | | | |
| | fed | pə, | 99 | , | Optimized | ine | Sample Program | | | | iew | ram | Error Checking |
| | Implemented | Documentea | Not WPILIB | ltem | Execution | Test Routine | ď | | | | SeV. | ,60 <u>,</u> | ; he |
| | em, | Ш | Ž | ת ש | cuti | Ř | əJdι | | | | Code Rev | Ţ | Ő |
| | ďμ | ၁၀ | lot | Menu | ě | esi | an | VI Name | Function Prototype | Notes | bo | -est | <u> 2</u> |
| ELEV FF | : X | X | _ | - <u>X</u> | Щ_ | _ | | ElevFF Calculate.vi | unction r rototype | Notes | | | <u>w</u> |
| LLLVII | X | | | X | | | | ElevFF CalculateVelocityOnly.vi | | | | | |
| | ,, | , , | Χ | | | | | ElevFF Execute.vi | | LabVIEW style single call | | | |
| | | | Χ | | | | | ElevFF_ExecuteVelocityOnly.vi | | LabVIEW style single call | | | |
| | Χ | Χ | | Χ | | | | ElevFF_MaxAchieveAccel.vi | | | | | |
| | Χ | Χ | | Χ | | | | ElevFF_MaxAchieveVelocity.vi | | | | | |
| | X | X | | Χ | | | | ElevFF_MinAchieveAccel.vi | | | | | |
| | X | | | Χ | | | | ElevFF_MinAchieveVelocity.vi | | | | | |
| | X | X | | X | | | | ElevFF_New_ZeroAccel.vi | | | | | |
| | X | Χ | | Χ | | | | ElevFF_New.vi | | | | | |
| | Implemented | X Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | | | | de Review | st Program | or Checking |
| | du, | õ | Λοί | Me | Ж | 7es | Sar | VI Name | Function Prototype | Notes | Code | Zes | Error |
| HOL_DRV_CTRL | . X | X | \overline{X} | \overline{X} | | • | , , , , , , , , , , , , , , , , , , , | HolDrvCtrl_AdvCalculate_Trajectory.vi | 71 | Added 1/24/2022 | | | |
| | Χ | Χ | Χ | Χ | | | | HolDrvCtrl_AdvCalculate.vi | | Added 1/24/2022 | | | |
| | Χ | Χ | | | SI | | | HolDrvCtrl_AtReference.vi | | Added 1/26/21 | | | |
| | Χ | Χ | | Χ | - 1 | | | HolDrvCtrl_Calculate_Trajectory.vi | | Added 1/26/21 | | | |
| | X | Χ | | Χ | - 1 | | | HolDrvCtrl_Calculate.vi | | Added 1/26/21 | | | |
| | X | Χ | Χ | Χ | | | | HolDrvCtrl_Execute_Trajectory.vi | | Added 1/24/2022 | | | |
| | X | X | Χ | X | | | | HolDrvCtrl_Execute.vi | | Future | | | |
| | X | Χ | | X | SI | | | HolDrvCtrl_New.vi | | Added 1/26/21 | | | |
| | | | \ \ \ \ | | | | | HolDrvCtrl_PackExecuteSP.vi | | Added 1/24/2022 | | | |
| | Χ | Χ | X | X | SI | | | | | | | | |
| | X | X | Χ | Χ | 31 | | | HolDrvCtrl_PackPID.vi | | | | | |
| | X X X | X X X | Χ | X | | | | HolDrvCtrl_PackProfPID.vi | | Added 1/24/2022 | | | |
| | X | X X X | Χ | Χ | SI SI | | | | | | | | |
| PID CONTROLLER | X | X X X X | Not WPILIB | Menu Item X X | SI | Test Routine | Sample Program | HolDrvCtrl_PackProfPID.vi HolDrvCtrl_SetEnabled.vi HolDrvCtrl_SetTolerance.vi | Function Prototype | Added 1/24/2022 Added 1/26/21 Added 1/26/21 Notes | Code Review | Test Program | Error Checking |
| PID CONTROLLER | X X X X X X | X X X X X | X Not WPILIB | X X X X X | Optimized 19 19 | Test Routine | Sample Program | HolDrvCtrl_PackProfPID.vi HolDrvCtrl_SetEnabled.vi HolDrvCtrl_SetTolerance.vi VI Name PIDController_AdvCalculate_FF_Sp_Pv_Per.vi | Function Prototype | Added 1/24/2022 Added 1/26/21 Added 1/26/21 Added 1/26/21 Notes Advanced PID | Code Review | Test Program | Error Checking |
| PID CONTROLLER | X | X X X X X | Not WPILIB | Menu Item X X | Optimized 19 19 | Test Routine | Sample Program | HolDrvCtrl_PackProfPID.vi HolDrvCtrl_SetEnabled.vi HolDrvCtrl_SetTolerance.vi | Function Prototype | Added 1/24/2022 Added 1/26/21 Added 1/26/21 Added 1/26/21 Notes Advanced PID Advanced PID Labview style helper. Advanced | Code Review | Test Program | Error Checking |
| 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 Not WPILIB | X X X X X X X X X X X X X X X X X X X | Optimized 19 19 | Test Routine | X Sample Program | HolDrvCtrl_PackProfPID.vi HolDrvCtrl_SetEnabled.vi HolDrvCtrl_SetTolerance.vi VI Name PIDController_AdvCalculate_FF_Sp_Pv_Per.vi PIDController_AdvCalculate_FF_Sp_Pv.vi PIDController_AdvExecute.vi PIDController_AdvExecute.vi | Function Prototype | Added 1/24/2022 Added 1/26/21 Added 1/26/21 Added 1/26/21 Notes Advanced PID Advanced PID | Code Review | Test Program | Error Checking |
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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 X X X X X | S S S S S S S S S S S S S S S S S S S | Test Routine | X Sample Program | HolDrvCtrl_PackProfPID.vi HolDrvCtrl_SetEnabled.vi HolDrvCtrl_SetTolerance.vi VI Name PIDController_AdvCalculate_FF_Sp_Pv_Per.vi PIDController_AdvCalculate_FF_Sp_Pv.vi PIDController_AdvExecute.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_Execute.vi PIDController_GetContinuousError.vi | Function Prototype | Added 1/24/2022 Added 1/26/21 Added 1/26/21 Notes Advanced PID Advanced PID Labview style helper. Advanced PID | 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.

| me interp | olatab | le rout | ines. | | | |
|-----------|--------|---------|-------|----|---|---------------------------------|
| X | X | | X | I | PIDController_NewPeriod.vi | |
| X | X | X | X | SI | PIDController_Pack_AdvLimits.vi | |
| X | X | X | X | SI | PIDController_Pack_AdvTuning.vi | |
| X | X | X | X | SI | PIDController_Pack_ErrorTolerance.vi | |
| X | X | X | X | SI | PIDController_Pack_InputLimits.vi | |
| X | X | X | X | SI | PIDController_Pack_Tuning.vi | |
| X | Χ | | X | SI | PIDController_Reset.vi | |
| X | Χ | | X | SI | PIDController_SetD.vi | |
| X | Χ | X | X | SI | PIDController_SetDerivativeFilter.vi | Advanced PID |
| X | X | X | No | | PIDController_SetFeedForward_OBSOLETE_DELETE.vi | Advanced PID, Obsolete – DELETE |
| X | X | X | No | | PIDController SetFFGain OBSOLETE DELETE.vi | Advanced PID, Obsolete – DELETE |
| | | | /10 | | TIDOGRADIOI_CONTCONIT_ODGGEETE_DEEETE.VI | Navarious 115, Observe Delette |
| X | Χ | | Χ | SI | PIDController_Setl.vi | |
| | | | | | PIDController_SetInputRange.vi | OBSOLETE – Removed |
| X | X | | X | SI | PIDController_SetIntegratorRange.vi | |
| X | X | X | X | SI | PIDController_SetOutputLimits.vi | Advanced PID |
| X | Χ | | X | SI | PIDController_SetP.vi | |
| X | X | X | X | SI | PIDController_SetPeriod.vi | |
| X | X | | X | SI | PIDController_SetPID.vi | |
| X | Χ | X | X | SI | PIDController_SetPIDF.vi | Advanced PID |
| X | Χ | | X | SI | PIDController_SetSetpoint.vi | |
| X | X | | X | SI | PIDController_SetTolerance.vi | |
| X | X | | X | SI | PIDController_SetTolerancePandV.vi | |
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| PROFILED PID CONTROLLER | | | | | | | | | h | | | | | |
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| X | | _= | | Not WPILIB | Menu | | Test Routine | Sample Program | · | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| X | PROFILED PID CONTROLLER | X | X | | X | SI | | | ProfiledPIDController_AtGoal.vi | | | | | |
| X | | X | Χ | | X | SI | | | ProfiledPIDController AtSetpoint.vi | | | | | |
| ProfiledPIDController_Calculate Meas StateGoal.vi | | X | Χ | | X | | | | ProfiledPIDController Calculate Meas Goal.vi | | | | | |
| X | | X | Χ | | | | | | ProfiledPIDController_Calculate_Meas_StateGoal_TrapCnsrt.vi | | | | | |
| X | | X | Χ | | | | | | ProfiledPIDController_Calculate_Meas_StateGoal.vi | | | | | |
| X | | Χ | Χ | | | | | | ProfiledPIDController_Calculate_Meas.vi | | | | | |
| | | Χ | Χ | | X | SI | | | ProfiledPIDController_DisableContInput.vi | | | | | |
| X | | | Χ | | X | SI | | | ProfiledPIDController_EnableContInput.vi | | | | | |
| X X SI ProfiledPIDController GetPeriod vi WPILIB has separate getters. X X X SI ProfiledPIDController GetPositionError vi X X X SI ProfiledPIDController GetSetpoint.vi X X X SI ProfiledPIDController GetVelocityError.vi X X X SI ProfiledPIDController New vi X X X I ProfiledPIDController New Period.vi X X X I ProfiledPIDController NewPeriod.vi X X X I ProfiledPIDController Reset PosOnly.vi X X X SI ProfiledPIDController Reset PosVel.vi X X X SI ProfiledPIDController SetSoal PosOnly.vi X X X SI ProfiledPIDController SetGoal PosOnly.vi X X X SI ProfiledPIDController SetGoal PosOnly.vi X X X SI ProfiledPIDController SetGoal PosOnly.vi X X | | X | X | X | X | 1 | | | ProfiledPIDController_Execute.vi | | Single call LabVIEW style function. | | | |
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| X X SI ProfiledPIDController_SetTolerance_PosOnly.vi | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| X X X SI ProfiledPIDController_SetTolerance_PosVel.vi | | | | | | | | | | | | | | |
| | | X | X | | X | SI | | | ProfiledPIDController_SetTolerance_PosVel.vi | | | | | |

| FRC LabVIEW Trajectory Library – VI Implementation I | List | | | | | | | | | | |
|--|------------|--|-----------|----------------------------------|----------------|--|---|----------|-------------|--------------|----------------|
| Revision 2.X 5/2/2022 – added implicit model follower and time | interpola | atable rout | tines. | | | | | | | | |
| | | Documented Not WPILIB | Menu Item | Execution Optimized Test Routine | Sample Program | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| RAMSETE | | X | | SI | | Ramsete_AtReference.vi | AtReference | | | | |
| | | X X | | X | | Ramsete_Calculate_Trajectory.vi Ramsete_Calculate.vi | calculate_trajectory calculate | | | | |
| | | \hat{X} X | X | X | | Ramsete_Diff_DO_Eng.vi | calculate | | | | |
| | | $\begin{array}{c c} X & X \\ \hline X & X \end{array}$ | X | X | | Ramsete Diff DO SI.vi | | | | | |
| | | XX | X | 1 | | Ramsete Execute ENG.vi | Use this one!! | | | | |
| | | XX | | SI | | Ramsete_Execute_PackTuning_ENG.vi | | | | | |
| | | XX | X | SI | | Ramsete_Execute_PackTuning.vi | | | | | |
| | | X X | | 1 | | Ramsete_Execute.vi | | | | | |
| | | X | | SI | | Ramsete_New_B_Z.vi | new(b, zeta) | | | | |
| | | X | | SI | | Ramsete_New.vi | new SetEnekled | | | | |
| } | | X X | | SI SI | | Ramsete_SetEnabled.vi Ramsete_SetTolerance.vi | SetEnabled SetTolerance | | | | |
| | | X | | X | | Ramsete SINC.vi | sinc | internal | | | |
| l | _ ^ | ^ | | ^ | | Namsete_Silvo.vi | SITIC | Internal | | | |
| | nplemented | Documented Not WPILIB | Wenu Item | Execution Optir Test Routine | Sample Prograi | MAL | Foresting Posts to a | Notes | Code Review | Test Program | Error Checking |
| SIMPLE MOTOR FEEDFORWARD | | $X \mid X$ | | SI | <u></u> | VI Name SimpleMotorFF_Calculate_CalcAccel.vi | Function Prototype | Notes | <u> </u> | <u> </u> | Ш |
| SIMPLE MOTOR FEEDFORWARD | | <u>^ </u> | X | SI | | SimpleMotorFF Calculate NextV Dt.vi | | | | | |
| | | X | | SI | | SimpleMotorFF Calculate.vi | public double calculate(double velocity, double acceleration) | | | | |
| | | X | | SI | | SimpleMotorFF_CalculateVelocityOnly.vi | public double calculate(double velocity) | | | | |
| | Χ . | X | X | X | | SimpleMotorFF_MaxAchieveAccel.vi | public double maxAchievableAcceleration(double maxVoltage, double velocity) | | | | |
| | X . | X | X | X | | SimpleMotorFF_MaxAchieveVel.vi | public double maxAchievableVelocity(double maxVoltage, double | | | | |
| | X | X | X | X | | SimpleMotorFF_MinAchieveAccel.vi | acceleration) public double minAchievableAcceleration(double maxVoltage, | | | | |
| | | ^ | | | | | double velocity) | | | | |
| | | X | | X | | SimpleMotorFF_MinAchieveVel.vi | public double minAchievableVelocity(double maxVoltage, double acceleration) | | | | |
| | X . | X | X | SI | | SimpleMotorFF_New.vi | public SimpleMotorFeedforward(double ks, double kv, double ka) | | | | |
| | | | | | | | public SimpleMotorFeedforward(double ks, double kv) | | | | |
| '====== GEOMETRY '======== | | | | | | | | | | | |
| | | Documented Not WPILIB | Menu Item | Execution Optimized Test Routine | Sample Program | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| COORDINATE AXIS | | X | | SI | | CoordAxis_D.vi | | | | | |
| | | X | X | SI | | CoordAxis_E.vi | | | | | |
| | | X X | X | SI | | CoordAxis_N.vi CoordAxis_New.vi | | | | | |
| | | X | | SI | | CoordAxis_New.vi | | | | | |
| | | X | | SI | | CoordAxis U.vi | | | | | |
| | | X | X | | | CoordAxis_W.vi | | | | | |
| · · | | | ' | | | · - | ' | 1 | <u>'</u> | | |

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Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. Routine Function Prototype Notes **COORDINATE SYSTEM** XX CoordSystem Convert Pose3d.vi X SI CoordSystem_Convert_Rotation3d.vi Χ Χ X SI X X X SI CoordSystem_Convert_Translation3d.vi XX X SI X CoordSystem EDN.vi XX X SI X CoordSystem NED.vi XX X SI X CoordSystem New.vi X SI X CoordSystem_NWU.vi XX Function Prototype VI Name Notes POSE2D Pose2d_Equals.VI boolean equals(other obj) Χ X X SI X X XX Pose2d_Exp.vi pose2d exp(twist2d twist) Χ Χ Χ SI Pose2d_getRotation.vi rotation2d getRotation() can also use cluster unpack X X X SI Pose2d getTranslation.vi translation2d getTranslation() can also use cluster unpack X X SI Pose2d getXY.vi X X X X SI Pose2d_getXYAngle.vi Pose2d Interpolate.vi XX X I XX XX Pose2d Log.vi twist2d log(pose2d end) $X \mid X$ X SI Pose2d Minus.vi transform2d minus(pose2d other) XX X SI Pose2d New TRRO.vi pose2d new(translation2d, rotation2d) XX X SI Pose2d New.vi pose2d new(double x, double y, rotation2d) Χ X X SI Pose2d Plus.vi pose2d plus(transform2d other) Χ Χ X SI Pose2d RelativeTo.vi pose2d relativeto(pose2d other) XX X SI Pose2d TransformBy.vi pose2d transformby(transform2d other) pose2d new() can use cluster constant VI Name Function Prototype Notes POSE3D Χ Pose3d Equals.VI SI XX Χ X Pose3d Exp.vi XX X SI Pose3d getRotation.vi XX X SI Pose3d getTranslation.vi $X \mid X$ X X SI Pose3d getXYZ.vi X X X Pose3d Interpolate.vi Χ XX Χ Pose3d_Log.vi X X SI Pose3d Minus.vi Χ Χ X X SI Pose3d New.vi X X X X X SI Pose3d New Default.vi X SI Pose3d_New_Trans3dRot3d.vi XX X SI Pose3d Plus.vi XX X SI Pose3d RelativeTo.vi XX No SI Pose3d RotationVectorToMatrix.vi Pose3d ToPose2d.vi $X \mid X$ X SI XX X SI Pose3d TransformBy.vi

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| Colaterior Col | FRC LabVIEW Trajectory Library – VI | | | | | | | | | _ | | | | |
|--|---|----------------------|-----------|-------------|-----------|-------------------------|------------|--------------|--|--------------------------------------|--------------------------------|------------|------------|-------------|
| ## MOTATIONS Fig. F | Revision 2.X 5/2/2022 – added implicit mode | el follower and time | e interpo | olatable | routin | es. Şed | | _ | | | | | | |
| GUATIONO X X X X X X X X X X | | | lemented | :umented | WPILIB | nu Item cution Optim | t Routine | nple Program | | | | le Review | t Program | or Checking |
| ### A X X & S S Spanning On Miles A X X | | | - | | Not | | | | | Function Prototype | Notes | <u>8</u> | Tes | Erro |
| ### A | | QUATERNION | | | | X S | | | | | + | | | |
| NOTATION | | | X | X | | X S | | | Quaternion_Get_LVQuat.vi | | | | | |
| X | | | | | | | | | | | | | | |
| ### ROTATIONED | | | | | | X S | | | | | | | | |
| X | | | X | X | | X S | | | Quaternion_New.vi | | | | | |
| X | | | | | | X S | | | | | | | | |
| X | | | | | | | | | | | | | | |
| Note | | | X | X | | X S | | | Quaternion_Plus.vi | | | | | |
| ROTATIONAD For the part of t | | | | | | X S | | | | | | | | |
| ### Princition Prototype | | | Χ | X | | X S | | | Quaternion_ i orotation/ector.vi | | | | | |
| ### Princition Prototype | | | fed | <i>p</i> e, | g | n Optimized | ne ne | rogram | | | | iew | 'am | cking |
| ### Princition Prototype | | | nen | nent | ЫГI | Item | outi | e P | | | | Rev | rogi | Che |
| ROTATION2D X X X S F Rotation2d CreateAngle w (national new) double agelges) conwell to radiants then create | | | pler | cnu | × 1 | ecu | st R | dui | | | | apc | st F | ō |
| X | | DOTATIONSD | _= | | <u>₹</u> | Ž Ž | | | | | Notes | ၓ | | <u> </u> |
| X | | ROTATION2D | | | | | | | | | convert to radians then create | | | |
| X X X S Rotation/G Equate; boolean equals (rotation/d other) | | | X | X | | X S | | | Rotation2d_CreateAngleRotations.vi | | | | | |
| X | | | | | | | | | | rotation2d new(double x, double y) | | | | |
| X | | | | | X | X S | | | | boolean equals(rotation2d otner) | New 1/26/21 | | | |
| Rotation2d GelRedians VI double gelRadians() use cluster unpack | | | X | X | , | X S | | | Rotation2d_GetCos.VI | | | | | |
| X | | | | | | | | | | | | | | |
| X | | | | | | | | | | double getRadians() | | | | |
| X | | | | | | | | | | double getSin() | use cluster unnack | | | |
| X | | | X | X | | X S | | | | | | | | |
| X | | | Χ | Χ | | X S | | | | | | | | |
| X | | | X | X | | X S | | | | | | | | |
| X | | | | | | X S | | | Rotation2d_Pius.vi Rotation2d_RotateBv.vi | | | | | |
| Totation2d new() | | | X | X | | X S | | | Rotation2d_Times.vi | rotation2d times(double scalar) | | | | |
| Part | | | X | X | | X S | | | Rotation2d_UnaryMinus.vi | | | | | |
| ROTATION3D X X X SI Rotation3d_Create_AxisAngle.vi X | | | | | | | | | | rotation2d new() | can use cluster constant | | | |
| ROTATION3D X X X SI Rotation3d_Create_AxisAngle.vi X | | | plemented | cumented | nt WPILIB | | st Routine | mple Program | | | | ide Review | st Program | õ |
| X X SI Rotation3d_Create_Default.vi X X X SI Rotation3d_Create_Quaternion.vi X X X SI Rotation3d_Create_RollPitchYaw.vi X X X SI Rotation3d_Equals.vi X X X SI Rotation3d_GetAxisAngle.vi X X X SI Rotation3d_GetQuaternion.vi X X X SI Rotation3d_GetQuaternion.vi X X X SI Rotation3d_GetXYZ.vi | | | 2 | Q | 8_ | We Exe | | | | Function Prototype | Notes | 8 | | Err |
| X X SI Rotation3d_Create_Quaternion.vi X X X SI Rotation3d_Create_RollPitchYaw.vi X X X SI Rotation3d_Equals.vi X X X SI Rotation3d_GetAxisAngle.vi X X X SI Rotation3d_GetQuaternion.vi X X X SI Rotation3d_GetQuaternion.vi X X X SI Rotation3d_GetXYZ.vi | | ROTATION3D | X | X | | X S | | | | | + | | | |
| X X X SI Rotation3d_Create_RollPitchYaw.vi X X X SI Rotation3d_Equals.vi X X X X SI Rotation3d_GetAxisAngle.vi X X X SI Rotation3d_GetQuaternion.vi X X X SI Rotation3d_GetXYZ.vi | | | X | X | | X S | | | | | + | | | |
| X X X SI Rotation3d_GetAxisAngle.vi X X X SI Rotation3d_GetQuaternion.vi X X X SI Rotation3d_GetXYZ.vi | | | X | X | | X S | | | Rotation3d_Create_RollPitchYaw.vi | | | | | |
| X X SI Rotation3d_GetQuaternion.vi X X X SI Rotation3d_GetXYZ.vi | | | | X | _ | X S | | | | | | | | |
| X X X SI Rotation3d GetXYZ.vi | | | | | * | X S | | | | | + | | | |
| X X SI Rotation3d_Interpolate.vi | | | X | X | | X S | | | Rotation3d_GetXYZ.vi | | | | | |
| | | | X | X | | X S | | | Rotation3d_Interpolate.vi | | | | | |

| X | X | X | SI | Rotation3d_Minus.vi | |
|---|---|---|----|----------------------------|--------|
| X | X | X | SI | Rotation3d_Plus.vi | |
| X | X | X | SI | Rotation3d_RotateBy.vi | |
| X | X | X | SI | Rotation3d_Times.vi | Т |
| X | X | X | | Rotation3d_ToRotation2d.vi | \Box |
| X | X | X | SI | Rotation3d_UnaryMinus.vi | |
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| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimi: | Test Routine | Sample Program | Function Prototype | Notes | Code Review | Test Program | Error Checking |
|-------------|-------------|------------|------------|-----------|-------------------|--------------|--------------------------------|--|--------------------------|-------------|--------------|----------------|
| TRANSFORM2D | Χ | Χ | | X | SI | | Transform2d_Create_PosePose.vi | transform2d new(pose2d, pose2d) | | | | |
| | Χ | Χ | | Χ | SI | | Transform2d_Create_TransRot.vi | transform2d new(translation2d, rotation2d) | | | | |
| | Χ | Χ | | X | SI | | Transform2d_Equals.VI | boolean equals(other transform2d) | | | | |
| | Χ | Χ | | X | SI | | Transform2d_GetRotation.VI | rotation2d getRotation() | use cluster unpack | | | |
| | Χ | Χ | | X | SI | | Transform2d_GetTranslation.VI | translation2d getTranslation() | use cluster unpack | | | |
| | Χ | Χ | X | X | SI | | Transform2d_GetXY.vi | | | | | |
| | X | Χ | X | X | SI | | Transform2d_GetXYAngle.vi | | | | | |
| | X | Χ | | X | SI | | Transform2d_Inverse.vi | transform inverse() | new | | | |
| | X | Χ | | X | Si | | Transform2d_Plus.vi | | | | | |
| | Χ | Χ | | Χ | SI | | Transform2d_Times.vi | transform2d times(double scalar) | | | | |
| | | | | | | | | transform2d new() | can use cluster constant | | | |

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| TRANSFORM3D | Χ | Χ | | Χ | SI | | | Transform3d_Create_Default.vi | | | | | |
| | Χ | Χ | | Χ | SI | | | Transform3d_Create_Pose3dPose.3dvi | | | | | |
| | Χ | Χ | | Χ | SI | | | Transform3d_Create_Trans3dRot3d.vi | | | | | |
| | Χ | Χ | | Χ | SI | | | Transform3d_Equals.VI | | | | | |
| | Χ | X | | Χ | SI | | | Transform3d_GetRotation3d.VI | | | | | |
| | Χ | Χ | | Χ | SI | | | Transform3d_GetTranslation3d.VI | | | | | |
| | Χ | Χ | Χ | Χ | SI | | | Transform3d_GetXYZ.vi | | | | | |
| | Χ | Χ | | Χ | SI | | | Transform3d_Inverse.vi | | | | | |
| | Χ | Χ | | Χ | Si | | | Transform3d_Plus.vi | | | | | |
| | Χ | Χ | | Χ | SI | | | Transform3d_Times.vi | | | | | |
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|---------------|-------------|------------|------------|-----------|--------------|-----------------------------|---------------------------------|--|------------------------|-------------|--------------|---------------|
| TRANSLATION2D | Χ | X | | X | SI | | Translation2d_Create_DistAng.vi | | | | | |
| | Χ | X | | X | SI | | Translation2d_Create.vi | translation2d new(double x, double y) | | | | |
| | Χ | X | | X | SI | | Translation2d_Equals.vi | boolean equals(translation other) | | | | |
| | Χ | X | | X | SI | | Translation2d_GetAngle.vi | | | | | |
| | Χ | Χ | | X | SI | | Translation2d_GetDistance.vi | double getDistance(translation2d other) | | | | |
| | Χ | X | | X | SI | | Translation2d_GetNorm.VI | double getNorm() | can use cluster unpack | | | |
| | Χ | X | | X | SI | | Translation2d_GetX.VI | double getX() | can use cluster unpack | | | |
| | Χ | X | X | X | SI | | Translation2d_GetXY.VI | | | | | |
| | Χ | X | | X | SI | | Translation2d_GetY.VI | double getY() | can use cluster unpack | | | |
| | Χ | Χ | | X | SI | | Translation2d_Interpolate.vi | | | | | |
| | Χ | Χ | | X | SI | | Translation2d_Minus.vi | translation2d minus(translation2d other) | | | | |
| | Χ | X | | X | SI | | Translation2d_Plus.vi | translation2d plus(translation2d other) | | | | |
| | X | X | | X | SI | | Translation2d_RotateBy.vi | translation2d rotateBy(rotation2d other) | | | | |

Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. XX 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 Function Prototype Notes TRANSLATION3D X Χ SI Translation3d Create.vi Translation3d_Create_Default.vi Χ X SI X Χ SI Translation3d_Create_DistAng.vi X X Χ Χ Χ SI Translation3d Div.vi Χ Translation3d Equals.vi X Χ SI X X SI Translation3d GetDistance.vi Translation3d_GetNorm.VI Χ Χ X SI XX X X SI Translation3d GetXYZ.vi XX X SI Translation3d Interpolate.vi XX X SI Translation3d Minus.vi XX X SI Translation3d Plus.vi Translation3d_RotateBy.vi XX X SI X X X SI Translation3d Times.vi Χ Χ X SI Translation3d_ToTranslation2d.vi X X X SI Translation3d UnaryMinus.vi VI Name Function Prototype Notes X TWIST2D X Χ SI Twist2d Create.vi twist new(x, y, theta) Twist2d Equals.VI SI boolean equals(obj other) X X X X SI Twist2d GetAll.VI Function Prototype Notes X TWIST3D SI Twist3d Create.vi Χ Χ X X X X SI Χ Twist3d Equals.VI X X X X SI X Twist3d GetAll.VI '======= **KINEMATICS** '======== Execution Optimized Menu Item Function Prototype Notes CHASSIS SPEEDS X ChassisSpeeds FromFieldRelativeSpeeds.VI chassisspeeds fromFieldRelativeSpeeds(double x, double y, double angvel, rotation2d robotangle) ChassisSPeeds GetXYOmega.vi X X X X SI chassisspeeds new (double xvel, double yvel, double angvel) XX X SI ChassisSpeeds New.vi can use cluster constant chassisspeeds new ()

| RC LabVIEW Trajectory Library – VI Implementation Louision 2.X 5/2/2022 – added implicit model follower and time i | | atable | | | | | | | | | |
|--|-------------|---------------------------------------|------------------|----------------------------------|--------------|--|---|---------------------------------------|-------------|--------------|----------------|
| | Implemented | Documented | Not WPILIB | Menu Item Execution Optimized | Test Routine | Sample Program In Manage August 19 A | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| DIFFERENTIAL DRIVE KINEMATICS | | X | | X I | | DiffKinematics_New.vi | diffDriveKine new(double trackWidth) | | | | |
| - | X | X - | + | X X X SI | X | DiffKinematics_toChassisSpeed.vi DiffKinematics_toWheelSpeed.vi | chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds) diffDriveWheelSpeed toWheelSpeeds(chassisSpeeds) | + | | | + |
| | nted | nted | 1/8 | m n Optimized | tine | Program | | | view | gram | ecking |
| | plemen | ocumente | Vot WPILIE | Menu Item Execution | Fest Routine | ample F | | | ode Re | st Pro | ror Che |
| | 4 | <u> </u> | <u> </u> | <u>× ×</u> | | δ VI Name | Function Prototype | Notes | ა | | <u> </u> |
| DIFFERENTIAL DRIVE ODOMETRY | | X | X | XX | | DiffOdometry_Execute.vi DiffOdometry_Update.vi | pose2d update(rotation2d gyro, double leftdist, double right dist) | DONT NEED Incorporates enhanced reset | | | |
| | | | | | | | diffDrOdom new(rotation gyro, pose initial) | | | | \perp |
| | | | | | | | diffDrOdom new(rotation gyro) void resetPosition(pose2d, rotation2d) pose2d getPoseMeters() | incorporated into "update" | | | |
| DIFFERENTIAL DRIVE WHEEL SPEEDS | | Documented | Not WPILIB | Menu Item Execution Op | Test Routine | A Name No Name | Function Prototype diffDrWheelSpeeds new() | Notes | Code Review | Test Progran | Error Checki |
| | X | <u>_</u> | + | XX | | DiffWheel Normalize.vi | diffDrWheelSpeeds new(double leftVel, double rightVel) void normalize(double maxVel) | | | | + |
| | ted | umented | Not WPILIB | X Menu Item | | So VI Name MecaKinematics_New.vi | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| MECANUM DRIVE KINEMATICS | | | | | | | | | | | + |
| MECANUM DRIVE KINEMATICS | X | X X | | XX | | MecaKinematics_SetInverseKinematics.vi | | | | | |
| MECANUM DRIVE KINEMATICS | X X X | X X X | | X X X X | | MecaKinematics_ToChassisSpeeds.vi | | | | | _ |
| MECANUM DRIVE KINEMATICS | X | X X X | | XX | | | | | | | |
| MECANUM DRIVE KINEMATICS | X X X X X | X X X X X X X X X X X X X X X X X X X | MPILIB WPILIB | X X X X X X | est Routine | MecaKinematics_ToChassisSpeeds.vi MecaKinematics_ToWheelSpeeds.vi MecaKinematics_ToWheelSpeedsZeroCenter.vi | | | ode Review | est Program | rror Checking |
| MECANUM DRIVE KINEMATICS | X | X X X X X X X X X X X X X X X X X X X | PILIB | Item X X X X X Item Optimized | | MecaKinematics_ToChassisSpeeds.vi MecaKinematics_ToWheelSpeeds.vi | Function Prototype | Notes | Code Review | Test Program | Error Checking |

| 2 – added implicit model follower and time | | latable ro | outines. | | | | | | | | | |
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| MECANUM DRIVE ODOMETRY | = | $\frac{\Box}{X}$ | | | _ | | MecaOdometry_Execute.vi | Function Flototype | Notes | - 0 | | Ш |
| MILOANOM DRIVE ODOMETRI | Х | X X | | X | | _ | MecaOdometry_CatKinematics.vi | | | | | |
| | X | X | X | | | | MecaOdometry_GetPose.vi | | | | | |
| | X | X | X | | | | MecaOdometry_New.vi | | | | | |
| | X | X | X | | | | MecaOdometry NewDefaultPose.vi | | | | | |
| | X | X | X | | | | MecaOdometry_Reset.VI | | | | | |
| | | X | X | | | | MecaOdometry_Update.vi | | | | | |
| | X | X | X | | | | MecaOdometry_UpdateWithTime.vi | | | | | |
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| | ηdu | 000 | j je | ĕ | est. | an | VI Name | Function Prototype | Notes | ροχ | Test | Error |
| MECANUM DRIVE WHEEL SPEEDS | <u> </u> | $\frac{Q}{X}$ | $X \ge X$ | <u>₩</u> | _ | | MecaWheel_New.Vi | public MecanumDriveWheelSpeeds(double | NOGS | 0 | 7 | |
| WIECANOW DRIVE WHEEL SPEEDS | ^ | ^ | ^ | 31 | | | INECAVITEEL_NEW.VI | frontLeftMetersPerSecond, double frontRightMetersPerSecond, | | | | |
| | | | | | | | | double rearLeftMetersPerSecond, double | | | | |
| | | | | | | | | rearRightMetersPerSecond) | | | | |
| | | X X | (X | SI | | | MecaWheel_GetAll.vi | · · | | | | |
| | X | X | X | X | | | MecaWheel_Normalize.vi | public void normalize(double | | | | |
| L | | | | | | | | attainableMaxSpeedMetersPerSecond) | | | | |
| | mplemented | Documented Not WPILIB | Menu Item | Execution Opti | Test Routine | Sample Progra | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| SWERVE DRIVE KINEMATICS | X | $X \mid X$ | | | Τ_ | Τ, | SwerveKinematics New4.VI | | For 4 module drives | | | - 4 |
| OVERVE BRIVE RINEMATION | X | | $X \times X$ | | | | SwerveKinematics NewX.VI | | uses array as input | | | |
| | | X X | | | | + | SwerveKinematics NormalizeWheelSpeeds.vi | public static void normalizeWheelSpeeds(SwerveModuleState[] | accountry ac input | | | |
| | | | , , | | | | | moduleStates, double attainableMaxSpeedMetersPerSecond) | | | | |
| | | | (X | | | | SwerveKinematics_ToChassisSpeeds4.VI | | For 4 module drives | | | |
| | Χ | X X | (X | | | | SwerveKinematics_ToChassisSpeedsX.VI | | uses array as input | | | |
| | X | Χ | X | | | | SwerveKinematics_ToSwerveModuleStates.VI | public SwerveModuleState[] | | | | |
| | | | | | | | | toSwerveModuleStates(ChassisSpeeds chassisSpeeds, | | | | |
| | ~ | X | X | + | - | + | SwerveKinematics_ToSwerveModuleStatesZeroCenter.VI | Translation2d centerOfRotationMeters) | | | | |
| | X | ^ | ^ | | | | Ower vernitiernatics_100wervervioudieotateszerocenter.VI | public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds) | | | | |
| | | | | | | | | public SwerveDriveKinematics(Translation2d wheelsMeters) | variable parameters (replace with | | | |
| | | | | | | | | | array and "4" calls) | | | |
| | | | | | | | | public ChassisSpeeds to ChassisSpeeds (Swerve Module State | variable parameters (replace with | | | |
| l | | | | | | | | wheelStates) | array and "4" calls) | | | |
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| SWERVE DRIVE ODOMETRY | | | | | | | SwerveOdometry_Execute4.vi | | | | | |
| | | | | | | | SwerveOdometry_ExecuteX.vi | | | | | |
| | | Χ | X | | | | SwerveOdometry_GetPosition.VI | public Pose2d getPoseMeters() | | | | |
| | X | Χ | X | | | | SwerveOdometry_New.VI | public SwerveDriveOdometry(SwerveDriveKinematics kinematics, | | | | |
| | ^ | ^` | ^ | | | | · — | | | | | |
| | | | | | | | Out and Other state Name 7 and 1 Miles | Rotation2d gyroAngle, Pose2d initialPose) | | | | |
| | | X | X | | | | SwerveOdometry_NewZeroCenter.VI | Rotation2d gyroAngle, Pose2d initialPose) public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) | | | | |

| Revision 2.X 5/2/2022 – added implicit model follower and time | | | ole routi | | | | | _ | | | | | |
|--|---------|----------------|---|----------------|----------------|--------------|----------|---|---|--|------------|---------------|----------|
| | X | | | X | | | | | oublic void resetPosition(Pose2d pose, Rotation2d gyroAngle) | | | | |
| | X | | X | X | | | | verveOdometry_Update4.VI | | For 4 module drives | | | |
| | X | | | | | | | verveOdometry_UpdateWithTime4.VI | | For 4 module drives | | | |
| | X | | X | X | | | | verveOdometry_UpdateWithTimeX.VI | | uses array as input | | | |
| | Χ | Χ | X | X | | | S | verveOdometry_UpdateX.VI | | uses array as input | | | |
| | | | | | | | | lp lp | public Pose2d updateWithTime(double currentTimeSeconds, | variable parameters (replace with array and "4" calls) | | | |
| | | | | | | | | R | | variable parameters (replace with | | | |
| | | | | | | | | μ S | SwerveModuleState moduleStates) | array and "4" calls) | | | |
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| SWERVE DRIVE MODULE STATE | X | \overline{X} | | X | SI | | | | public int compareTo(SwerveModuleState o) | | | | |
| | | | | X | SI | | | verveModuleState Get.vi | | | | | |
| | X | X | | X | SI | | | | public SwerveModuleState(double speedMetersPerSecond, | | | | |
| | | | | | | | | ir | Rotation2d angle) | | | | |
| | X | X | | Χ | SI | | S | verveModuleState_Optimize.vi p | public SwerveModuleState optimize(SwerveModuleState desired, | | | | |
| | | | | | | | | <u> R</u> | Rotation2d angle) | | | | |
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| CUBIC HERMITE SPLINE | | | | | | | | | | not needed, use cluster unpack | | | |
| | X | X | | X | | | C | ubicHermiteSpline_getControlVectorFromArrays.vi | rivate SimpleMatrix getControlVectorFromArrays(double[] | | | | |
| | | | | X | | | | ılır ubicHermiteSpline makeHermiteBasis.vi p | nitialVector, double[]finalVector) vivate SimpleMatrix makeHermiteBasis() | | | | |
| | X | | | X | | | | | ublic CubicHermiteSpline(double[] xInitialControlVector, double[] | | | | |
| | ^ | ^ | | ^ | | | ۲ | y abici lettiliteSpilite_New.vi | FinalControlVector, double[] yInitialControlVector, double[] | | | | |
| | | | | | | | | V | FinalControlVector) | | | | |
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| POSE WITH CURVATURE | X | \overline{X} | \sqcap | \overline{X} | SI | | | | public PoseWithCurvature(Pose2d poseMeters, double | | | | 7 |
| . 332 33 | | | | | | | [| c | urvatureRadPerMeter) | | | | |
| | | | | | | | | p | oublic PoseWithCurvature() | can use cluster constant | | | |
| | | | | | | | | p | public Pose2d poseMeters | not needed, use cluster unpack | | | |
| | | | | | | | | p | ublic double curvatureRadPerMeter | not needed, use cluster unpack | | | |
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| QUINTIC HERMITE SPLINE | X | X | | X | 7 — | | | | rivate SimpleMatrix getControlVectorFromArrays(double[] | | | - 17 | 7 |
| CONTROL CONTROL | Ľ | | <u> </u> | Ľ, | | | | ir | nitialVector, double[] finalVector) | | | | |
| | X | Χ | | Χ | | | _ C | uinticHermiteSpline makeHermiteBasis.vi p | rivate SimpleMatrix makeHermiteBasis() | | | | |
| | X | Χ | | Χ | | | | uinticHermiteSpline_New.vi p | ublic QuinticHermiteSpline(double[] xInitialControlVector, louble[] xFinalControlVector, double[] yInitialControlVector, | | | | |
| | | | | | | | | d | louble[] xFinalControlVector, double[] yInitialControlVector, | | | | |
| | | | | | | | | d | ouble[] yFinalControlVector) | | | | |
| | | | | | | | | | | | | | |

Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. protected SimpleMatrix getCoefficients() not needed, use cluster unpack Execution Optin Vot WPILIB Menu Item VI Name Function Prototype Notes SPLINE (Abstract class) X X Spline_getPoint.vi public PoseWithCurvature getPoint(double t) Spline(int degree) public static class ControlVector public ControlVector(double[] x, double[] y) implemented as data structure Execution Optimized Routine Test VI Name Function Prototype Notes SPLINE HELPER X SplineHelp GetCubicCtrlVector.vi private static Spline.ControlVector getCubicControlVector(double scalar, Pose2d point) XX Χ SplineHelp GetCubicCtrlVectorsFromWayPts.vi public static Spline.ControlVector[] getCubicControlVectorsFromWaypoints(Pose2d start, Translation2d[] interiorWaypoints, Pose2d end) X X X X SplineHelp GetCubicCtrlVectorsFromWeightedWayPts.vi X X X No SplineHelp GetCubicSpline Calc1.vi internal X X X No SplineHelp GetCubicSpline Calc2.vi internal X X X No SplineHelp GetCubicSpline Calc3.vi internal Χ X X SplineHelp getCubicSplinesFromControlVectors.vi public static CubicHermiteSpline[] qetCubicSplinesFromControlVectors(Spline.ControlVector start, Translation2d[] waypoints, Spline.ControlVector end) X X X SI SplineHelp GetQuinticCtrlVector.vi private static Spline ControlVector getQuinticControlVector(double scalar, Pose2d point) SplineHelp_GetQuinticCtrlVectorsFromWayPts.vi public static List<Spline.ControlVector> REMOVED 2762 getQuinticControlVectorsFromWaypoints(List<Pose2d> waypoints) SplineHelp GetQuinticCtrlVectorsFromWeightedWayPts.vi REMOVED 2762 SplineHelp getQuinticSplinesFromControlVectors.vi public static QuinticHermiteSpline[] X X Χ getQuinticSplinesFromControlVectors(Spline.ControlVector[] controlVectors) X X X X SplineHelp GetQuinticSplinesFromWeightedWayPts.vi New 2762 XX Χ SplineHelp_GetQuinticSplinesFromWayPts.vi New 2762 X X No SplineHelp ThomasAlgorithm.vi private static void thomasAlgorithm(double[] a, double[] b, double[] internal c, double[] d, double[] solutionVector) Optim WPILIB Jenu Item Execution 'est Function Prototype Notes SPLINE PARAMETERIZER X X SplineParam Spline T0 T1.vi public static List<PoseWithCurvature> parameterize(Spline spline, double t0, double t1) X X X SplineParam Spline.vi public static List<PoseWithCurvature> parameterize(Spline spline) X X No SplineParam StackGet.vi internal X X No SplineParam_StackPop.vi internal X X X No SplineParam StackPush.vi internal

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

| RC LabVIEW Trajectory Library – VI Implementation | | | | | | | | | | | | |
|--|---|-----------------------|------------|-------------|---|----------------|---|---|--|-------------|--------------|----------------|
| Revision 2.X 5/2/2022 – added implicit model follower and time | interpented interpretation | olatabl Documented | ole rout | ltem | Execution Optimized Test Routine | Sample Program | | | | de Review | t Program | or Checking |
| | р | ρο | Not | Menu | Exe Tes | San | VI Name | Function Prototype | Notes | Ö | Tes | Errc |
| TRAJECTORY | 'X | X | | X | | | Trajectory_Concatenate.vi | | | | · | |
| | Χ | Χ | | X | | | Trajectory_equals.vi | boolean equals(other obj) | FUTURE | | | |
| | Χ | X | | | SI | | Trajectory_GetStates.vi | public List <state> getStates()</state> | not needed, use unpack | | | |
| | Χ | X | | | SI | | Trajectory_GetTotalTime.vi | public double getTotalTimeSeconds() | not needed, use unpack | | | |
| | X | X | | No | SI | | Trajectory_lerp_double.vi | private static double lerp(double startValue, double endValue, | internal | | | |
| | X | | | No | SI | + | Trainstery Jorn Boso vi | double t) | internal | | | |
| | X | X | | NO | 51 | | Trajectory_lerp_Pose.vi | private static Pose2d lerp(Pose2d startValue, Pose2d endValue, double t) | internal | | | |
| | X | X | | X | SI | +- | Trajectory_New_Empty.vi | double ty | | | | |
| | X | X | | | SI | | Trajectory_New.vi | public Trajectory(final List <state> states)</state> | | | | |
| | X | X | | X | - | | Trajectory_RelativeTo.vi | public Trajectory relativeTo(Pose2d pose) | | | | |
| | X | X | | Х | | | Trajectory_Sample.vi | public State sample(double timeSeconds) | | | | |
| | X | X | X | X | | | Trajectory SampleReverse.vi | | Sample in reverse order. Negate | | | |
| | | | | | | | , , | | sample. | | | |
| | X | X | | X | | | Trajectory_TransformBy.vi | public Trajectory transformBy(Transform2d transform) | | | | |
| | | | | | | | | public Pose2d getInitialPose() | can use cluster unpack, array index | | | |
| | mplemented | ocumen | Vot WPILIB | Menu Item | Execution Op Test Routine | Sample Prog | VI Name | Function Prototype | Notes | Sode Rev | Fest Prog | Frror Che |
| TRAJECTORY_STATE | : X | X | _< | | SI | | TrajectoryState_Equals.vi | boolean equals(other obj) | Notes | - 0 | | <u>w</u> |
| MADEOTOKI_OTATE | X | X | X | X | SI | | TrajectoryState_GetAll.vi | boolean equals(other obj) | | | | |
| | X | | | | O, | - 1 | | | | | | |
| | . X | X | | X | SI | | | | | | | |
| | | | | | SI | | TrajectoryState_GetPose.vi | State interpolate(State endValue, double i) | | | | |
| | X X | X X X | | X | SI SI | | | State interpolate(State endValue, double i) public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State() | | | | |
| TRAJECTORY CONFIG | X X | X | Not WPILIB | Menu Item | | Sample Program | TrajectoryState_Interpolate.vi TrajectoryState_New.vi | public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State() Function Prototype | Notes Implemented differently, can't | Code Review | Test Program | Error Checking |
| TRAJECTORY CONFIG | X X | X X | Not WPILIB | X X | otimized S | mple | TrajectoryState_Interpolate.vi TrajectoryState_New.vi | public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State() Function Prototype public TrajectoryConfig addConstraint(TrajectoryConstraint | Implemented differently, can't | Code Review | Test Program | Error Checking |
| TRAJECTORY CONFIG | X X Implemented | X X Documented | Not WPILIB | X Menu Item | Execution Optimized © | mple | TrajectoryState_GetPose.vi TrajectoryState_Interpolate.vi TrajectoryState_New.vi VI Name TrajectoryConfig_AddConstraint.vi TrajectoryConfig_AddConstraints.vi | public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State() Function Prototype public TrajectoryConfig addConstraint(TrajectoryConstraint constraint) public TrajectoryConfig addConstraints(List extends TrajectoryConstraint constraints) | | Code Review | Test Program | Error Checking |
| TRAJECTORY CONFIG | X X Implemented | X X Documented | Not WPILIB | X Menu Item | otimized S | mple | TrajectoryState_GetPose.vi TrajectoryState_Interpolate.vi TrajectoryState_New.vi VI Name TrajectoryConfig_AddConstraint.vi | public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State() Function Prototype public TrajectoryConfig addConstraint(TrajectoryConstraint constraint) public TrajectoryConfig addConstraints(List extends TrajectoryConstraint constraints) | Implemented differently, can't duplicate. Implemented differently, can't | Code Review | Test Program | Error Checking |
| TRAJECTORY CONFIG | X X Implemented | X X Documented | Not WPILIB | X Menu Item | Execution Optimized © | mple | TrajectoryState_GetPose.vi TrajectoryState_Interpolate.vi TrajectoryState_New.vi VI Name TrajectoryConfig_AddConstraint.vi TrajectoryConfig_AddConstraints.vi TrajectoryConfig_Create.vi | public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State() Function Prototype public TrajectoryConfig addConstraint(TrajectoryConstraint constraint) public TrajectoryConfig addConstraints(List extends</td <td>Implemented differently, can't duplicate. Implemented differently, can't</td> <td>Code Review</td> <td>Test Program</td> <td>Error Checking</td> | Implemented differently, can't duplicate. Implemented differently, can't | Code Review | Test Program | Error Checking |
| TRAJECTORY CONFIG | X X X X X X X X X X X | X X Documented | Not WPILIB | X Menu Item | Execution Optimized © | mple | TrajectoryState_GetPose.vi TrajectoryState_Interpolate.vi TrajectoryState_New.vi VI Name TrajectoryConfig_AddConstraint.vi TrajectoryConfig_AddConstraints.vi TrajectoryConfig_Create.vi TrajectoryConfig_GetCentripetalAccel.vi | public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State() Function Prototype public TrajectoryConfig addConstraint(TrajectoryConstraint constraint) public TrajectoryConfig addConstraints(List extends TrajectoryConstraint constraints) public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq) | Implemented differently, can't duplicate. Implemented differently, can't duplicate. | Code Review | Test Program | Error Checking |
| TRAJECTORY CONFIG | X X X X X X | X X Documented | | X Menu Item | Execution Optimized © | mple | TrajectoryState_GetPose.vi TrajectoryState_Interpolate.vi TrajectoryState_New.vi VI Name TrajectoryConfig_AddConstraint.vi TrajectoryConfig_AddConstraints.vi TrajectoryConfig_Create.vi TrajectoryConfig_GetCentripetalAccel.vi TrajectoryConfig_GetConstraints.vi | public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State() Function Prototype public TrajectoryConfig addConstraint(TrajectoryConstraint constraint) public TrajectoryConfig addConstraints(List extends TrajectoryConstraint constraints) public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq) public List <trajectoryconstraint> getConstraints()</trajectoryconstraint> | Implemented differently, can't duplicate. Implemented differently, can't duplicate. Implemented differently, can't duplicate. | Code Review | Test Program | Error Checking |
| TRAJECTORY CONFIG | X X X X X X X X X X X X X X X X X X X | X X Documented | | X Wenu Item | Execution Optimized © | mple | TrajectoryState_GetPose.vi TrajectoryState_Interpolate.vi TrajectoryState_New.vi VI Name TrajectoryConfig_AddConstraint.vi TrajectoryConfig_AddConstraints.vi TrajectoryConfig_Create.vi TrajectoryConfig_GetCentripetalAccel.vi TrajectoryConfig_GetConstraints.vi TrajectoryConfig_GetConstraints.vi | public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State() Function Prototype public TrajectoryConfig addConstraint(TrajectoryConstraint constraint) public TrajectoryConfig addConstraints(List extends TrajectoryConstraint constraints) public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq) | Implemented differently, can't duplicate. Implemented differently, can't duplicate. Implemented differently, can't duplicate. | Code Review | Test Program | Error Checking |
| TRAJECTORY CONFIG | X X X X X X X X X X X X X X X X X X X | X X Documented | | X Wenu Item | Execution Optimized © | mple | TrajectoryState_Interpolate.vi TrajectoryState_New.vi VI Name TrajectoryConfig_AddConstraint.vi TrajectoryConfig_AddConstraints.vi TrajectoryConfig_Create.vi TrajectoryConfig_GetCentripetalAccel.vi TrajectoryConfig_GetEndVelocity.vi TrajectoryConfig_GetEndVelocity.vi TrajectoryConfig_GetKinematicsDiffDrive.vi | public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State() Function Prototype public TrajectoryConfig addConstraint(TrajectoryConstraint constraint) public TrajectoryConfig addConstraints(List extends TrajectoryConstraint constraints) public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq) public List <trajectoryconstraint> getConstraints()</trajectoryconstraint> | Implemented differently, can't duplicate. Implemented differently, can't duplicate. Implemented differently, can't duplicate. | Code Review | Test Program | Error Checking |
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| TRAJECTORY CONFIG | X X X X X X X X X X X X X X X X X X X | X X Documented | X | X Wenu Item | Execution Optimized © | mple | TrajectoryState_GetPose.vi TrajectoryState_Interpolate.vi TrajectoryState_New.vi VI Name TrajectoryConfig_AddConstraint.vi TrajectoryConfig_AddConstraints.vi TrajectoryConfig_Create.vi TrajectoryConfig_GetCentripetalAccel.vi TrajectoryConfig_GetConstraints.vi TrajectoryConfig_GetConstraints.vi TrajectoryConfig_GetConstraints.vi TrajectoryConfig_GetConstraints.vi TrajectoryConfig_GetEndVelocity.vi TrajectoryConfig_GetKinematicsDiffDrive.vi TrajectoryConfig_GetKinematicsMecanumfDrive.vi TrajectoryConfig_GetKinematicsSwerveDrive.vi | public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State() Function Prototype public TrajectoryConfig addConstraint(TrajectoryConstraint constraint) public TrajectoryConfig addConstraints(List extends TrajectoryConstraint constraints) public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq) public List <trajectoryconstraint> getConstraints()</trajectoryconstraint> | Implemented differently, can't duplicate. Implemented differently, can't duplicate. Implemented differently, can't duplicate. | Code Review | Test Program | Error Checking |
| TRAJECTORY CONFIG | X X X X X X X X X X X X X X X X X X X | X X Documented | | X X X X X X | Execution Optimized © | mple | TrajectoryState_GetPose.vi TrajectoryState_Interpolate.vi TrajectoryState_New.vi VI Name TrajectoryConfig_AddConstraint.vi TrajectoryConfig_AddConstraints.vi TrajectoryConfig_Create.vi TrajectoryConfig_GetCentripetalAccel.vi TrajectoryConfig_GetConstraints.vi TrajectoryConfig_GetConstraints.vi TrajectoryConfig_GetConstraints.vi TrajectoryConfig_GetConstraints.vi TrajectoryConfig_GetKinematicsDiffDrive.vi TrajectoryConfig_GetKinematicsMecanumfDrive.vi TrajectoryConfig_GetKinematicsSwerveDrive.vi TrajectoryConfig_GetKinematicsSwerveDrive.vi TrajectoryConfig_GetMaxVelAccel.vi | public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State() Function Prototype public TrajectoryConfig addConstraint(TrajectoryConstraint constraint) public TrajectoryConfig addConstraints(List extends TrajectoryConstraint constraints) public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq) public List <trajectoryconstraint> getConstraints() public double getEndVelocity()</trajectoryconstraint> | Implemented differently, can't duplicate. Implemented differently, can't duplicate. Implemented differently, can't duplicate. Implemented differently, can't duplicate. can use cluster unpack | Code Review | Test Program | Error Checking |
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| TRAJECTORY CONFIG | X X X X X X X X X X X X X X X X X X X | X X Documented | X | X X X X X X | Execution Optimized © | mple | TrajectoryState_Interpolate.vi TrajectoryState_New.vi VI Name TrajectoryConfig_AddConstraint.vi TrajectoryConfig_AddConstraints.vi TrajectoryConfig_Create.vi TrajectoryConfig_GetCentripetalAccel.vi TrajectoryConfig_GetConstraints.vi TrajectoryConfig_GetConstraints.vi TrajectoryConfig_GetConstraints.vi TrajectoryConfig_GetConstraints.vi TrajectoryConfig_GetConstraints.vi TrajectoryConfig_GetKinematicsDiffDrive.vi TrajectoryConfig_GetKinematicsDiffDrive.vi TrajectoryConfig_GetKinematicsSwerveDrive.vi TrajectoryConfig_GetMaxVelAccel.vi TrajectoryConfig_GetStartVelocity.vi TrajectoryConfig_GetStartVelocity.vi TrajectoryConfig_GetStartVelocity.vi TrajectoryConfig_GetStartVelocity.vi TrajectoryConfig_GetVoltageDiffDrive.vi | public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State() Function Prototype public TrajectoryConfig addConstraint(TrajectoryConstraint constraint) public TrajectoryConfig addConstraints(List extends TrajectoryConstraint constraints) public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq) public List <trajectoryconstraint> getConstraints() public double getEndVelocity()</trajectoryconstraint> | Implemented differently, can't duplicate. Implemented differently, can't duplicate. Implemented differently, can't duplicate. Implemented differently, can't duplicate. can use cluster unpack can use cluster unpack | Code Review | Test Program | Error Checking |
| TRAJECTORY CONFIG | X X X X X X X X X X X X X X X X X X X | X X Documented | X | X Wenu Item | ي Execution Optimized ي المحادثة المحا | mple | TrajectoryState_Interpolate.vi TrajectoryState_New.vi VI Name TrajectoryConfig_AddConstraint.vi TrajectoryConfig_AddConstraints.vi TrajectoryConfig_Create.vi TrajectoryConfig_GetCentripetalAccel.vi TrajectoryConfig_GetConstraints.vi TrajectoryConfig_GetConstraints.vi TrajectoryConfig_GetConstraints.vi TrajectoryConfig_GetConstraints.vi TrajectoryConfig_GetEndVelocity.vi TrajectoryConfig_GetKinematicsDiffDrive.vi TrajectoryConfig_GetKinematicsMecanumfDrive.vi TrajectoryConfig_GetKinematicsSwerveDrive.vi TrajectoryConfig_GetMaxVelAccel.vi TrajectoryConfig_GetStartVelocity.vi TrajectoryConfig_GetStartVelocity.vi | public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State() Function Prototype public TrajectoryConfig addConstraint(TrajectoryConstraint constraint) public TrajectoryConfig addConstraints(List extends TrajectoryConstraint constraints) public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq) public List <trajectoryconstraint> getConstraints() public double getEndVelocity()</trajectoryconstraint> | Implemented differently, can't duplicate. Implemented differently, can't duplicate. Implemented differently, can't duplicate. Implemented differently, can't duplicate. can use cluster unpack | 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.

| ne interp | olalab | ne rout | mes. | | | | | |
|-----------|--------|---------|------|----|--|---|------------------------|--|
| X | | | | | TrajectoryConfig_SetEndVelocity.vi | public TrajectoryConfig setEndVelocity(double | | |
| | | | | | | endVelocityMetersPerSecond) | | |
| X | X | | X | SI | TrajectoryConfig_setKinematicsDiffDrive.vi | public TrajectoryConfig setKinematics(DifferentialDriveKinematics | | |
| | | | | | | kinematics) | | |
| X | X | | X | SI | TrajectoryConfig setKinematicsMecanumfDrive.vi | public TrajectoryConfig setKinematics(MecanumDriveKinematics | | |
| | | | | | | kinematics) | | |
| X | X | | Χ | SI | TrajectoryConfig_setKinematicsSwerveDrive.vi | public TrajectoryConfig setKinematics(SwerveDriveKinematics | | |
| | | | | | | kinematics) | | |
| X | X | | X | SI | TrajectoryConfig_setReversed.vi | public TrajectoryConfig setReversed(boolean reversed) | | |
| X | | | | | TrajectoryConfig SetStartVelocity.vi | public TrajectoryConfig setStartVelocity(double | | |
| | | | | | | startVelocityMetersPerSecond) | | |
| X | X | X | Χ | SI | TrajectoryConfig_setVoltageDiffDrive.vi | , | | |
| | | | | | | public double getMaxVelocity() | can use cluster unpack | |
| | | | | | | public double getMaxAcceleration() | can use cluster unpack | |
| | | • | | • | • | LIGHT AND OTHER COUNTY DOLLTHING FOR OTHER | <u> </u> | |

| _ | | | | | | | | NOTE ADD OTHER "SET" ROUTINES FOR OTHER CONTRAINTS HERE, SINCE NEW CONTRAINTS ARE | | | | |
|--------------------------------------|---------------|----------------|--------------|-------------|---------------------|--------------|---|---|---|-------------|--------------|----------------|
| | | | | | | | | SPECIFIC AND NOT GENERIC. | | | | |
| | | | | | g | | | | | | | |
| | | | | | nize | | <i>a</i> | | | | | |
| | ~ | _ | | | ptin | 4. | yrar | | | > | 2 | Checking |
| | nplemented | Documented | 18 | 4 | Execution Opt | Test Routine | Progr | | | Code Review | Test Program | €CK! |
| | ле | ner | Vot WPILIB | Menu Item | ıtio, | Sou | e F | | | Re | roc | Š |
| | ble | CC | , Z | nue | ecı | st F | S VI Name | | | ge | st F | Error |
| г | _=_ | | _ ≥ | | Ě | | | Function Prototype | Notes | ပိ | | Eu |
| TRAJECTORY GENERATE | X | X | | X | | | TrajectoryGenerate_Make_Cubic_CtrlVect.vi | public static Trajectory generateTrajectory(Spline.ControlVector initial, List <translation2d> interiorWaypoints, Spline.ControlVector end, TrajectoryConfig config.)</translation2d> | uses cubic splines | | | |
| | Χ | Χ | | X | | | TrajectoryGenerate_Make_Cubic.vi | public static Trajectory generateTrajectory(Pose2d start, List <translation2d> interiorWaypoints, Pose2d end,</translation2d> | uses cubic splines | | | |
| | X | X | X | X | | | TrajectoryGenerate_Make_Generic.vi | TrajectoryConfig config) Helper to bring these all together | Use this one!!! | | | |
| | X | \overline{x} | | X | | | TrajectoryGenerate_Make_Quintic_CtrlVect.vi | public static Trajectory generateTrajectory(ControlVectorList | uses quintic splines | | | |
| | | | | | | | | controlVectors, TrajectoryConfig config) | | | | |
| | Χ | | X | | | | TrajectoryGenerate_Make_Quintic_Weighted.vi | | New 2762 | | | |
| | X | X | | X | | | TrajectoryGenerate_Make_Quintic.vi | public static Trajectory generateTrajectory(List <pose2d> waypoints, TrajectoryConfig config)</pose2d> | uses quintic splines | | | |
| | X | X | | X | | | TrajectoryGenerate_splinePointsFromSplines.vi | public static List <posewithcurvature> splinePointsFromSplines(Spline∏ splines)</posewithcurvature> | | | | |
| _ | | | | | | | | ориног опполтотноринос (оринос) | | | | |
| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| TRAJECTORY GENERATE (Control Vector) | | | | | | | | public ControlVectorList(int initialCapacity) | may not need, just data | | | |
| | | | | | | | | public ControlVectorList() | may not need, just data | | | |
| | | | | | | | | public ControlVectorList(Collection extends Spline.ControlVector collection) | may not need, just data | | | |
| TRAJECTORY PARAMETERIZE∫ | X Implemented | X Documented | X Not WPILIB | S Menu Item | Execution Optimized | Test Routine | VI Name TrajectoryParam calcStuffFwd.vi | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| THOUSE TON FAMILIENIZE | X | \hat{x} | X | No | | | TrajectoryParam_calcStuffRev.vi | | | | | |
| | X | X | | No | | | TrajectoryParam_enforceAccel.vi | private static void enforceAccelerationLimits(boolean reverse, List <trajectoryconstraint> constraints, ConstrainedState state)</trajectoryconstraint> | This routines needs to be changed when new constraints are added. | | | |
| | Χ | Χ | X | No | | | TrajectoryParam_enforceVelocity.vi | | This routines needs to be changed when new constraints are added. | | | |
| | | | | | | | | | | | | |

Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. TrajectoryParam timeParam.vi public static Trajectory timeParameterizeTrajectory(List<PoseWithCurvature> points. List<TrajectoryConstraint> constraints, double startVelocityMetersPerSecond, double endVelocityMetersPerSecond, double maxVelocityMetersPerSecond, double naxAccelerationMetersPerSecondSq, boolean reversed) Not WPILIB Menu Item **Test** VI Name Function Prototype Notes TRAJECTORY PARAMETERIZE CONSTRAINED STATE X ConstrainedState New.vi X ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double maxAccelerationMetersPerSecondSq) X X X X ConstrainedState SetMaxAccel.vi X X X ConstrainedState SetMinAccel.vi X X X X ConstrainedState SetVelAccel.vi X X X X ConstrainedState SetVelocity.vi ConstrainedState() Function Prototype Notes TrajectoryUtil_fromPathWeaverJSON.vi TRAJECTORY UTIL X X public static Trajectory fromPathweaverJson(Path path) X TrajectoryUtil MakeWeightedWayPoint ENG.vi $X \mid X \mid X \mid X$ Χ TrajectoryUtil_MakeWeightedWayPoint.vi X X X X TrajectoryUtil toPathWeaverJSON.vi Χ public static void toPathweaverJson(Trajectory trajectory, Path public static Trajectory deserializeTrajectory(String json) public static String serializeTrajectory(Trajectory trajectory) Menu Item Function Prototype Notes TRAPEZOID PROFILE X TrapProfConstraint New.vi X X TrapProfile Calculate.vi X X X X No TrapProfile_Direct.vi Χ Private, remove from menu X X X X TrapProfile_Execute.vi X X Χ Χ SI TrapProfile Execute AtGoal.vi X X TrapProfile IsFinished.vi X X TrapProfile New DefInitial.vi Χ Χ Χ TrapProfile New.vi XX TrapProfile_ShouldFlipAcceleration.vi No Private, remove from menu XX Χ TrapProfile TimeLeftUntil.vi XX Χ TrapProfile TotalTime.vi $X \mid X$ X TrapProfState Equals.vi TrapProfState New.vi $X \mid X$ X

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

| / Trajectory Library – VI Implementation I | _ist | | | | | | | | | |
|---|---------------|--------------|------------|-------------|---------------------|--------------|----------------|--|--|------------------------------|
| 2/2022 – added implicit model follower and time | | olatab | ole rou | tines. | | | | | | |
| INTRIPETAL ACCELERATION CONSTRAINT | X | 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 | public CentripetalAccelerationConstraint(double maxCentripetalAccelerationMetersPerSecondSq) | Can use cluster pack for now |
| · | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | | VI Name | Function Prototype | Notes |
| DIFF DRIVE KINEMATIC CONSTRAINT | X | X | | X | | | | DiffDriveKinematicsConstraint_getMaxVelocity.vi DiffDriveKinematicsConstraint_getMinMaxAccel.vi | public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, | |
| | X | X | | X | SI | | | DiffDriveKinematicsConstraint_New.vi | double curvatureRadPerMeter, double velocityMetersPerSecond) public DifferentialDriveKinematicsConstraint(final DifferentialDriveKinematics kinematics, double maxSpeedMetersPerSecond) | |
| DIFF DRIVE VOLTAGE CONSTRAINT | X Implemented | X Documented | Not WPILIB | X Menu Item | Execution Optimized | Test Routine | | VI Name DiffDriveVoltageConstraint_getMaxVelocity.vi DiffDriveVoltageConstraint_getMinMaxAccel.vi | Function Prototype public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax | Notes |
| | | | | | | | | | getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) | |
| | X | X | | X | SI | | | DiffDriveVoltageConstraint_New.vi | public DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage) | |
| ELLIPTICAL REGION CONSTRAINT | < Implemented | Documented | Not WPILIB | < Menu Item | Execution Optimized | Test Routine | | VI Name | Function Prototype | Notes |
| ELLIPTICAL REGION CONSTRAINT | X X X | | | X X X | | | | EllipRegionConstraint_getEllipRegion.vi EllipRegionConstraint_getMinMaxAccel.vi EllipRegionConstraint_lsPoseInRegion.vi EllipRegionConstraint_New.vi | | |
| l | ^ | | | | | | | Limbrive Ground rather Time w. vi | | <u> </u> |

| 5/2/2022 – added implicit model follower and time | interp | olatab | ole rout | tines. | | | | | _ | |
|---|-----------------|----------------|---------------------------------------|---------------|--------------------------|--------------|----------------|---|---|-----------------------------------|
| JERK CONSTRAINT | / / Implemented | Documented | X X X X X X X X X X X X X X X X X X X | Menu Item | ত Execution Optimized | Test Routine | Sample Program | VI Name JerkConstraint_getMaxVelocity.vi JerkConstraint_getMinMaxAccel.vi JerkConstraint_New.vi | Routine exists, it is just a shell Routine exists, it is just a shell | Notes FUTURE FUTURE FUTURE FUTURE |
| MAX VELOCITY CONSTRAINT | X X Implemented | Documented | Not WPILIB | X X Wenu Item | いい い Execution Optimized | Test Routine | Sample Program | VI Name MaxVelocityConstraint_getMaxVelocity.vi MaxVelocityConstraint_getMinMaxAccel.vi MaxVelocityConstraint_New.vi | Function Prototype | Notes |
| MECANUM DRIVE KINEMATICS CONSTRAINT | X X Implemented | X X Documented | | X X Menu Item | S Execution Optimized | Test Routine | Sample Program | VI Name MecaDriveKinematicsConstraint_getMaxVelocity.vi MecaDriveKinematicsConstraint_getMinMaxAccel.vi MecaDriveKinematicsConstraint_New.vi | Function Prototype | Notes |
| RECTANGULAR REGION CONSTRAINT | X X Implemented | Documented | Not WPILIB | X X Wenu Item | | Test Routine | Sample Program | VI Name RectRegionConstraint_getRectRegion.vi RectRegionConstraint_getMinMaxAccel.vi RectRegionConstraint_IsPoseInRegion.vi RectRegionConstraint New.vi | Function Prototype | Notes |
| SWERVE DRIVE KINEMATICS CONSTRAINT | Implemented | X Documented | Not WPILIB | X Menu Item | Execution Optimized | Test Routine | Sample Program | VI Name SwerveDriveKinematicsConstraint_getMaxVelocity.vi SwerveDriveKinematicsConstraint_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 | | | SwerveDriveKinematicsConstraint_New.vi | Newpublic SwerveDriveKinematicsConstraint(final SwerveDriveKinematics kinematics, double maxSpeedMetersPerSecond) | Can use cluster pack for now |

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

| a miphon moder follower and time | | | | | | | | | |
|----------------------------------|-------------|------------|------------|-----------|---------------------|--------------|----------------------------------|--------------------|-------|
| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | Function Prototype | Notes |
| TRAJECTORY CONSTRAINT | X | | X | X | | | TrajConstraint_GetMaxVelocity.vi | | |
| | X | | X | Χ | | | TrajConstraint_GetMinMaxAccel.vi | | |
| | Χ | | Χ | Χ | | | TrajConstraint_GetType.vi | | |
| | | | | | | | | | |

X X Menu Item
Solve Execution Optimi TRAJECTORY CONSTRAINT (Min Max) X X X Function Prototype Notes Constraint_MinMax_New Constraint_MinMax_New.vi Constraint_MinMax_NewMinMax.VI Constraint MinMax New

'======== UTILITY

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

| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | VI Name | Function Prototype | Notes |
|------|-------------|------------|------------|-----------|---------------------|--------------|----------------|---|--------------------|---|
| UTIL | Χ | Χ | X | X | SI | | | Util ApproxEqual.vi | | |
| | Χ | Χ | Χ | X | | | | Util_Array_PoseWCurv_to_XY.vi | | |
| | Χ | Χ | Χ | X | SI | | | Util_CalcDist.vi | | |
| | Χ | Χ | X | X | SI | | | Util_GetLibraryVersion.vi | | |
| | Χ | Χ | X | X | SI | | | Util_GetLibUsage.vi | | |
| | X | X | X | X | | | | Util_GetTime.vi | | Once tested completely, this should be optimized! |
| | Χ | Χ | X | No | N/A | | | Util_LibraryGlobals.vi | | Global Variables – no block diag. |
| | Χ | Χ | X | X | | | | Util_Trajectory_Absolute_To_Relative.vi | | |
| | Χ | Χ | X | X | | | | Util_Trajectory_ReadFile.vi | | |
| | Χ | Χ | Χ | X | | | | Util_Trajectory_to_XY.vi | | |
| | Χ | Χ | X | No | | | | Util_Trajectory_WriteFile_Config.vi | | internal |
| | Χ | Χ | X | No | | | | Util_Trajectory_WriteFile_OneState.vi | | internal |
| | Χ | Χ | X | X | | | | Util_Trajectory_WriteFile_PathFinder.vi | | |
| | Χ | Χ | X | No | | | | Util_Trajectory_WriteFile_PathFinderConfig.vi | | internal |
| | Χ | Χ | X | X | | | | Util_Trajectory_WriteFile_Pathweaver.vi | | |
| | Χ | Χ | X | No | | | | Util_Trajectory_WriteFile_States.vi | | internal |
| | Χ | Χ | X | No | | | | Util_Trajectory_WriteFile_WayPoints.vi | | internal |
| | Χ | Χ | X | X | | | | Util_Trajectory_WriteFile.vi | | |
| | Χ | Χ | X | X | | | | Util_TrajectoryState_Meters_To_Inches.vi | | |
| | Χ | Χ | X | X | | | | Util_TrajState_to_DiffDrive_WheelPos.vi | | |
| | Χ | Χ | Χ | X | | | | Util_DispWaypoint_Eng_To_SI.vi | | |
| | Χ | Χ | X | X | | | | Util_DispWaypoint_To_CubicInput.vi | | |
| | Χ | Χ | Χ | X | | | _ | Util_DispWaypoint_To_QuinticInput.vi | | |
| | Χ | Χ | Χ | X | | | _ | Util_DispWeightedWaypiont_Eng_To_WeightedWaypoint | | |
| | Χ | Χ | X | No | | | | Util_DispWeightedWayPoint_To_WeightedWayPoint.vi | | Sorry about the confusing name |

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CONVERSIONS

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THESE ROUTINES ARE SPECIFIC TO LABVIEW. THEY DO NOT HAVE A

FRC LabVIEW Trajectory Library – VI Implementation List
Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines.
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 | Χ | Χ | Χ | SI | | | Conv_Centimeters_Meters.vi | | |
| | Χ | Χ | Χ | Χ | SI | | | Conv_Deg_Radians.vi | | |
| | Χ | Χ | Χ | Χ | SI | | | Conv_Deg_Rotations.vi | | |
| | Χ | X | Χ | Χ | SI | | | Conv_Feet_Meters.vi | | |
| | Χ | Χ | Χ | Χ | SI | | | Conv_GyroDegrees_Heading.vi | | |
| | Χ | Χ | Χ | Χ | SI | | | Conv_Heading_AngleRadians.vi | | |
| | Χ | X | Χ | Χ | SI | | | Conv_Inches_Meters.vi | | |
| | Χ | X | Χ | X | SI | | | Conv_Kilograms_Pounds.vi | | |
| | Χ | X | Χ | Χ | SI | | | Conv_Meters_Feet.vi | | |
| | Χ | X | Χ | X | SI | | | Conv_Meters_Inches.vi | | |
| | Χ | X | Χ | Χ | SI | | | Conv_Pose2d_SI_Eng.vi | | |
| | Χ | X | Χ | X | SI | | | Conv_Pounds_Kilograms.vi | | |
| | Χ | 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 | | |
| | Χ | X | X | X | SI | | | Conv_Rotations_Radians.vi | | |
| | Χ | 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 | | Χ | SI | | | Units_DegreesToRadians.vi | | |
| | Χ | Χ | | Χ | SI | | | Units_DegreesToRotations.vi | | |
| | Χ | Χ | | Χ | SI | | | Units_FeetToMeters.vi | | |
| | Χ | Χ | | Χ | SI | | | Units_InchesToMeters.vi | | |
| | Χ | Χ | | Χ | SI | | | Units_MetersToFeet.vi | | |
| | Χ | Χ | | Χ | SI | | | Units_MetersToInches.vi | | |
| | Χ | Χ | | Χ | SI | | | Units_MillisecondsToSeconds.vi | | |
| | Χ | Χ | | Χ | SI | | | Units_RadiansPerSecondToRotationsPerMinute.vi | | |
| | Χ | Χ | | Χ | SI | | | Units_RadiansToDegrees.vi | | |
| | Χ | Χ | | Χ | SI | | | Units_RadiansToRotations.vi | | |
| | Χ | Χ | | Χ | SI | | | Units_RotationsPerMinuteToRadiansPerSecond.vi | | |
| | Χ | Χ | | Χ | SI | | | Units_RotationsToDegrees.vi | | |
| | Χ | Χ | | Χ | SI | | | Units_RotationsToRadians.vi | | |
| | Χ | X | | Χ | SI | | | Units_SecondsToMilliseconds.vi | | |

'======== PATHFINDER UTIL

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

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

FRC LabVIEW Trajectory Library – VI Implementation List

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

X X X X X

PathfinderUtil_ToTrajectoryStates.vi

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

| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program I Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
|----------|-------------|------------|------------|-----------|---------------------|--------------|---------------------------------|--------------------|-------|-------------|--------------|----------------|
| DC MOTOR | | Χ | | X | SI | | DCMotor_GetAndymark9015.vi | | | | | |
| | Χ | Χ | | X | SI | | DCMotor_GetAndymarkRs775_125.vi | | | | | |
| | Χ | Χ | | Χ | SI | | DCMotor_GetBag.vi | | | | | |
| | Χ | X | | Χ | SI | | DCMotor_GetBanebotsRs550.vi | | | | | |
| | Χ | X | | X | SI | | DCMotor_GetBanebotsRs775.vi | | | | | |
| | Χ | X | | X | SI | | DCMotor_GetCIM.vi | | | | | |
| | Χ | Χ | | Χ | SI | | DCMotor_GetCurrent.vi | | | | | |
| | Χ | X | | Χ | SI | | DCMotor_GetFalcon500.vi | | | | | |
| | Χ | Χ | | X | SI | | DCMotor_GetMiniCIM.vi | | | | | |
| | Χ | X | | Χ | SI | | DCMotor_GetNEO.vi | | | | | |
| | Χ | X | | Χ | SI | | DCMotor_GetNEO550.vi | | | | | |
| | Χ | X | | Χ | SI | | DCMotor_GetRomiBuiltIn.vi | | | | | |
| | Χ | X | | Χ | SI | | DCMotor_GetVex775Pro.vi | | | | | |
| | Χ | X | | Χ | SI | | DCMotor_New.vi | | | | | |
| | Χ | Χ | | Χ | SI | | DCMotor_PickMotor.vi | | | | | |
| | | | | | | | | | | | | |

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

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

> VI Name Function Prototype Notes DIFFERENTIAL DRIVE POSE ESTIMATOR X XX DiffDrivePoseEst AddVisionMeasurement.vi X DiffDrivePoseEst_FillStateVector.vi DiffDrivePoseEst GetEstimatedPosition.vi Χ DiffDrivePoseEst_Kalman_F_Callback.vi Χ DiffDrivePoseEst_Kalman_H_Callback.vi Χ DiffDrivePoseEst_New.vi XX Χ DiffDrivePoseEst_ResetPosition.vi XX Χ DiffDrivePoseEst SetVisionMeasurementStdDevs.vi

| n 2.X 5/2/2022 – added implicit model follower and tim | | | | | | DiffDrive Decer Eat Handata vii | | | T |
|--|--|---|--|------------------------------------|----------------|--|-------------|--------------------------|---|
| | X | X | X | | | DiffDrivePoseEst_Update.vi DiffDrivePoseEst_UpdateWithTime.vi | | | |
| | X | X | X | | | DiffDrivePoseEst_OpuateWithTime.vi DiffDrivePoseEst_VisionCorrect_Callback.vi | | | |
| | X | \hat{x} | X | | | DiffDrivePoseEst VisionCorrect Kalman H Callback.vi | | | |
| | | | | De G | | Dilibritor codest_violorocitest_taimar_r_cambaok.vi | | <u> </u> | |
| | olemented | Documented | Menu Item | Execution Optimize Test Routine | mple Program | | Code Review | st Program | |
| | | | | Ä P | | VI Name Function Prototype Notes | රි | | |
| EXTENDED KALMAN FILTE | | | X | | | ExtendedKalmanFilter_Correct_OnlyUY.vi | | | |
| | X | X | X | | | ExtendedKalmanFilter_Correct.vi Just a shell, not functional! | | | |
| | X | X | X | | | ExtendedKalmanFilter_GetP_Single.vi | | | |
| | X | X | X | | | ExtendedKalmanFilter_GetP.vi | | | |
| | X | X | X | | | ExtendedKalmanFilter_GetXHat_Single.vi | | | |
| | X | X | X | | | ExtendedKalmanFilter_GetXHat.vi | | | |
| | X | X | X | | | ExtendedKalmanFilter_New.vi | | | |
| | X | X | X | | | ExtendedKalmanFilter_Predict.vi ExtendedKalmanFilter Reset.vi | | | |
| | X | X | X | | | ExtendedKalmanFilter_Reset.vi ExtendedKalmanFilter_SetP.vi | | | - |
| | X | X | X | | | ExtendedKalmanFilter_SetF.vi ExtendedKalmanFilter_SetXHat_Single.vi | | | |
| | X | \hat{x} | X | | | ExtendedKalmanFilter SetXHat.vi | | | |
| | | X | , , , | | | Extended (alman net _Oct (rat.v) | | | |
| | | | | timize | 'am | | | ~ | |
| | Implemented | Documented Not Mel 18 | Menu Item | Execution Optimize Test Routine | | VI Name Function Prototype Notes | Code Review | Test Program | |
| KALMAN FILTE | 7 | X | X | Execution Optimize X Test Routine | | KalmanFilter_Correct.vi | ge | Test Program | |
| KALMAN FILTE | R X | X X | X | | | KalmanFilter_Correct.vi KalmanFilter_GetK | ge | Test Program | |
| KALMAN FILTE | R X X X | X X X | X X X | | | KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi | ge | Test Program | |
| KALMAN FILTE | ER X X X X X X X X X | X X X | X X X X | X | | KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat | ge | Test Program | |
| KALMAN FILTE | X X X X X | X X X X | X X X X | X | | KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat | ge | Test Program | |
| KALMAN FILTE | | X X X X X | X X X X X | X | | KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat_Single KalmanFilter_New.vi | ge | Test Program | |
| KALMAN FILTE | X X X X X X X X | X X X X X | X X X X X X | X | | KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_New.vi KalmanFilter_New.vi KalmanFilter_New.vi | ge | Test Program | |
| KALMAN FILTE | X X X X X X X X | X X X X X | X X X X X X X | X | | KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat_Single KalmanFilter_New.vi KalmanFilter_Predict.vi KalmanFilter_Reset.vi | ge | Test Program | |
| KALMAN FILTE | X X X X X X X X X X X X X X X X X X X | X X X X X X X X | X X X X X X X X | X X X | | KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat_Single KalmanFilter_New.vi KalmanFilter_Predict.vi KalmanFilter_Reset.vi KalmanFilter_Reset.vi | ge | Test Program | |
| KALMAN FILTE | X X X X X X X X | X X X X X X X X | X X X X X X X | X | | KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat_Single KalmanFilter_New.vi KalmanFilter_Predict.vi KalmanFilter_Reset.vi | ge | Test Program | |
| KALMAN FILTE | X X X X X X X X X X X X X X X X X X X | ocumented X X X X X X X X X X X X X X X X X X X | Item X X X X X X X X X X X X X X X X X X X | Optimized X X X X X | mple Program | KalmanFilter_CetK KalmanFilter_GetKSingle.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_New.vi KalmanFilter_Predict.vi KalmanFilter_Reset.vi KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat | Review | est Program Test Program | |
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| KALMAN FILTER | R X X X X X X X X X X X X X X X 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 X X X X X | Sample Program | KalmanFilter_Correct.vi KalmanFilter_GetK KalmanFilter_GetK_Single.vi KalmanFilter_GetXHat KalmanFilter_GetXHat KalmanFilter_DetXHat KalmanFilter_New.vi KalmanFilter_Predict.vi KalmanFilter_Reset.vi KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat KalmanFilter_SetXHat_Single VI Name Function Prototype Notes | Review | Program | |
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| | X | X | | X | | | | DCMotorSim_GetCurrentDrawAmps.vi | | | | | |
| | X | Χ | | X | | | | DCMotorSim_New_MOI.vi | | | | | |
| | Χ | Χ | | X | | | | DCMotorSim_New_Plant.vi | | | | | |
| | X | Χ | | Χ | | | | DCMotorSim_SetInputVoltage.vi | | | | | |
| | X | X | | X | | | | DCMotorSim Update.vi | | | | | |

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

Optimized Function Prototype DIFFERENTIAL DRIVE TRAIN SIM $X \mid X$ DiffDriveTrainSim ClampInput.vi X X X DiffDriveTrainSim CreateKitbotSim EstMass.vi XX X DiffDriveTrainSim CreateKitbotSim EstMassMOI.vi X X DiffDriveTrainSim CreateKitbotSim.vi X XX Χ DiffDriveTrainSim GetCurrentDrawAmps.vi X X Χ DiffDriveTrainSim GetCurrentGearing.vi XX Χ DiffDriveTrainSim GetDynamics.vi XX X DiffDriveTrainSim GetHeading.vi XX X DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi Χ Χ DiffDriveTrainSim GetLeftPositionMeters.vi X Χ Χ DiffDriveTrainSim GetLeftVelocityMetersPerSecond.vi X DiffDriveTrainSim_GetOutput_Single.vi Χ Χ Χ X X X DiffDriveTrainSim GetPose.vi Χ X X DiffDriveTrainSim GetRightCurrentDrawAmps.vi Χ Χ DiffDriveTrainSim GetRightPositionMeters.vi X X X X DiffDriveTrainSim GetRightVelocityMetersPerSecond.vi X X Χ DiffDriveTrainSim GetState Single.vi XX Χ DiffDriveTrainSim GetState.vi XX Χ DiffDriveTrainSim KitBotWheelSize.vi XX Χ DiffDriveTrainSim New Mass MOI.vi X X Χ DiffDriveTrainSim New.vi $X \mid X$ Χ DiffDriveTrainSim SetCurrentGearing.vi XX DiffDriveTrainSim SetInputs.vi X XX DiffDriveTrainSim SetPose.vi X Χ Χ Χ DiffDriveTrainSim SetState.vi Χ X Χ DiffDriveTrainSim_ToughBoxMiniGearRatio.vi Χ DiffDriveTrainSim_ToughBoxMiniMotor.vi Χ X X Χ X DiffDriveTrainSim Update.vi Optin Function Prototype Notes ElevatorSim_GetCurrentDraw.vi ELEVATOR SIM X ElevatorSim GetPositionMeters.vi X X X XX X ElevatorSim GetVelocityMetersPerSecond.vi XX ElevatorSim HasHitLowerLimit.vi X XX X ElevatorSim HasHitUpperLimit.vi ElevatorSim_New_LinSys_NoNoise.vi ElevatorSim_New_LinSys.vi ElevatorSim New NoNoise.vi Χ Χ Χ ElevatorSim New.vi X X X No ElevatorSim RKF45 Func.vi Χ Χ Χ ElevatorSim_SetInputVoltage.vi X ElevatorSim SetState.vi X X XX ElevatorSim Update.vi X Needed because this doesn't extend. ElevatorSim_UpdateX.vi Χ X X Χ ElevatorSim WouldHitLowerLimit.vi X X X X X ElevatorSim WouldHitUpperLimit.vi

Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. Function Prototype Notes FLYWHEEL SIM X FlyWheelSim_GetAngularVelocityRadPerSec.vi X X FlyWheelSim_GetAngularVelocityRPM.vi Χ X Χ X X X FlyWheelSim GetCurrentDrawAmps FlyWheelSim_New_LinSys Future FlyWheelSim_New_LinSys_MOI_NoNoise Future FlyWheelSim New LinSys NoNoise Future FlyWheelSim_New_MOI.vi X X Χ XX X FlyWheelSim SetInput.vi XX Χ FlyWheelSim SetState.vi XX Χ FlyWheelSim Update.vi Function Prototype Notes LINEAR SYSTEM SIM X X LinearSystemSim_ClampInput.vi X LinearSystemSim_GetCurrentDrawAmps.vi DONT IMPLEMENT... LinearSystemSim_GetOutput_Single.vi X X X Χ LinearSystemSim_GetOutput.vi Χ Χ X X X LinearSystemSim New LinearSystemSim_New_NoNoise.vi Χ X LinearSystemSim SetInput Array.vi Doesn't use clamp? Χ Χ Χ LinearSystemSim_SetInput_Single.vi X X Χ LinearSystemSim_SetInput.vi X X Χ LinearSystemSim Setstate.vi XX Χ LinearSystemSim_Update.vi XX No LinearSystemSim_UpdateX.vi X X X No LinearSystemSim_UpdateY.vi Venu Item Function Prototype Notes SINGLE JOINT ARM SIM X Χ SngJntArmSim EsitmateMOI.vi XX X SngJntArmSim_GetAngleRads.vi X X SngJntArmSim GetCurrentDraw.vi Χ SngJntArmSim_GetVelocityRadsPerSec.vi XX Χ X X X SngJntArmSim_HasHitLowerLimit.vi Χ Χ Χ SngJntArmSim_HasHitUpperLimit.vi Χ Χ SngJntArmSim New.vi Χ X X No SngJntArmSim Rkf45 Func.vi Χ Χ Χ SngJntArmSim_SetInputVoltage.vi X X Χ SngJntArmSim SetState.vi X X SngJntArmSim_Update.vi X Χ Χ SngJntArmSim_UpdateX.vi Χ Χ Χ X SngJntArmSim_WouldHitLowerLimit.vi Χ Χ Χ SngJntArmSim_WouldHitUpperLimit.vi

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

| MAT BUILDER | X Implemented | X Documented | Not WPILIB | X Menu Item | <u>ত</u> Execution Optimized | Test Routine | Sample Program | VI Name Function Prototype MatBuilder_Create.vi | Notes | Code Review | Test Program | Error Checking |
|-------------|---------------|--------------|------------|-------------|------------------------------|--------------|----------------|--|-------------------------|-------------|--------------|----------------|
| WAT BOILDER | X | X | | X | SI | | | MatBuilder Fill.vi | | | | |
| l | Implemented | Documented | Not WPILIB | Item | Execution Optimized [5] | Test Routine | Sample Program | Interpolation Interpolation Interpolation | | Code Review | ogram | Error Checking |
| | eu | ĬĮ. | Ν | Į, | inti | 8 | ple | | | C O | Progr | õ |
| | ldu | 700 | ot | Menu | Ş. | est | am | VI Name Function Prototype | Natas | oqe ,oq | est | <u>0</u> |
| MATRIX | X | X | _< | <u> </u> | SI | _ | | VI Name Function Prototype Matrix_AssignBlock.vi | Notes | | | |
| WATRIA | \hat{X} | \hat{x} | | X | SI | | | Matrix Block.vi | | | | |
| | | | | | O, | | | Matrix_ChangeBoundsUnchecked.vi | | | | |
| | Χ | Х | | Χ | SI | | | Matrix_Create.vi | | | | |
| | | | | | | | | Matrix Det.vi | | | | |
| | Χ | Χ | | Χ | SI | | | Matrix_Diag.vi | | | | |
| | | | | | | | | Matrix_Div_Scalar.vi | labview has function | | | |
| | | | | | | | | Matrix_ElementPower.vi | | | | |
| | Χ | Χ | | Χ | SI | | | Matrix_ElementSum.vi | | | | |
| | | | | | | | | Matrix_ElementTimes.vi | | | | |
| | | | | | | | | Matrix_Equals.vi | | | | |
| | | X | | X | 1 | | | Matrix_Exp.vi | | | | |
| • | X | X | | X | SI | | | Matrix_ExtractColumnVector.vi | | | | |
| | Χ | Χ | | Χ | SI | | | Matrix_ExtractFrom.vi | | | | |
| | ~ | X | | X | SI | | | Matrix_ExtractMatrix.vi Matrix ExtractRowVector.vi | | | | |
| | X | X | | X | SI | | | Matrix_Extractrowvector.vi | | | | |
| | ^ | ^ | | ^ | SI | | | Matrix Get.vi | labview has function | | | |
| | Χ | X | | Χ | 1 | | | Matrix Ident.vi | WPILIB calls this EYE | | | |
| | | | | | | | | Matrix Inv.vi | VVI IEID GAIIG TIIG ETE | | | |
| | Χ | Χ | | Χ | SI | | | Matrix_IsEqual.vi | | | | |
| | | | | | | | | Matrix_IsIdentical.vi | | | | |
| | Χ | Χ | | Χ | I | | | Matrix_LLTDecompose.vi | | | | |
| | | | | | | | | Matrix_Max.vi | | | | |
| | | | | | | | | Matrix_MaxAbs.vi | | | | |
| | | | | | | | | Matrix_Mean.vi | | | | |
| | | | | | | | | Matrix_MinInternal.vi | | | | |
| | | | | | | | | Matrix_Minus_Matrix.vi | | | | |
| | V | V | | V | , | | | Matrix_Minus_Scalar.vi | | | | |
| | Χ | X | | Χ | I | | | Matrix_NormF.vi Matrix_NormIndP1.vi | | | | |
| | | | | | | | | Matrix_Plus_Matrix.vi | | | | |
| | | | | | | | | Matrix_Plus_Scalar.vi | | | | |
| | Χ | X | | X | I | | | Matrix_Pow.vi | THIS NEEDS WORK!!!! | | | |
| | X | X | | X | SI | | | Matrix_SetColumn.vi | | | | |
| | X | X | | Χ | SI | | | Matrix_SetRow.vi THERE ARE LOTS OF OTHER MATRIX FUNCTIONS THAT SHOULD BE INCLUDED HERE FOR ISOLATION. | | | | |
| | | | | | | | | Matrix_Solve.vi | | | | |
| | | | | | | | | Matrix_Times_Matrix.vi | | | | |
| | | | | | | | | Matrix_Times_Scalar.vi | | | | |
| | · · | ~ | | V | 0/ | | _ | Matrix_Trace.vi | | | | |
| | X | X | Χ | X | SI | | | Matrix_Transpose.vi Matrix WithinTolerance.vi | | | | |
| | ۸ | | ^ | ٨ | | | | IVIAUIX_VVIUIIII I OIEIAIIGE.VI | | | | |

Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. VI Name Function Prototype Notes NOTE Matrix also has an SIMPLE MATRIX X SimpleMatrix ExtractMatrix.vi ExtractMatrix with different calling parameters.... YUK. Function Prototype Notes MATRIX HELPER X X X X SI MatrixHelper CooerceSize.vi MatrixHelper_MultCooerceBSize.vi MatrixHelper_Zero.vi VI Name Function Prototype Notes VECTOR BUILDER X VecBuilder_1x1Fill.vi Χ Χ SI X X X VecBuilder 2x1Fill.vi X SI VecBuilder 3x1Fill.vi X SI X X SI VecBuilder 4x1Fill.vi X X X SI VecBuilder_5x1Fill.vi X X X SI VecBuilder 6x1Fill.vi X X X SI VecBuilder 7x1Fill.vi XX X SI VecBuilder_8x1Fill.vi VecBuilder 9x1Fill.vi VecBuilder 10x1Fill.vi X X X X SI VecBuilder_ArrayBy1Fill.vi '======== MATH '======== Not WPILIB Function Prototype Notes ANGLE STATISTICS X X X X AngleStats_AngleAdd_CallbackHelp.vi AngleStats_AngleAdd.vi
AngleStats_AngleMean_CallbackHelp.vi X X X X X X ΧI AngleStats_AngleMean.vi X X X X X AngleStats_AngleResidual_CallbackHelp.vi XX X I AngleStats AngleResidual.vi

Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. Execution Optir Routine Menu Item Function Prototype VI Name Notes MathUtil AngleModulus.vi MATH UTILITY X X SI X MathUtil_ApplyDeadband.vi X Χ Χ SI Χ X SI MathUtil Clamp Int.vi X MathUtil_Clamp.vi Χ Χ X SI Χ X SI Χ MathUtil InputModulus.vi Χ X Si MathUtil Interpolate.vi Χ Optin Menu Item Function Prototype Notes MERWE SCALED SIGMA POINTS X X X MerweScSigPts ComputeWeights.vi Χ X SI MerweScSigPts GetNumSigmas.vi XX X SI MerweScSigPts GetWc Single.vi XX X SI MerweScSigPts_GetWc.vi MerweScSigPts_GetWm_Single.vi XX X SI Χ MerweScSigPts_GetWm.vi X X SI Χ MerweScSigPts_New_Default.vi Χ XI Χ Χ X MerweScSigPts_New.vi Χ Χ Χ MerweScSigPts SigmaPoints.vi Optim Checking Not WPILIB Venu Item VI Name Function Prototype Notes NUMERICAL INTEGRATION X NumIntegrate Func Ax Bu K.vi NOT USED. Should this be used X or abandoned??? X NumIntegrate Rk4 Dbl X U.vi X X Χ NumIntegrate_Rk4_Dbl_X.vi X Χ Χ NumIntegrate_Rk4_Mat_X_U.vi X Χ Χ Χ Χ NumIntegrate_Rk4_Mat_X.vi NumIntegrate_Rkdp_Func_A.vi Χ Χ No NumIntegrate Rkdp Func B1.vi X X No SI Χ Χ No SI NumIntegrate_Rkdp_Func_B1B2.vi X X NumIntegrate Rkdp Func B2.vi No SI XX No I Numintegrate Rkdp Impl.vi XX Χ NumIntegrate_RKDP_Mat_X_U.vi New replacement for RKF45 NumIntegrate Rkf45 Func A.vi XX No SI NumIntegrate_Rkf45_Func_B1.vi XX No SI NumIntegrate_Rkf45_Func_B1B2.vi XX No SI XX No SI NumIntegrate Rkf45 Func B2.vi NumIntegrate_RKf45_Func_Bs.vi Removed. Replaced with newer functions. NumIntegrate_RKf45_Func_Ch.vi Removed. Replaced with newer functions. NumIntegrate_RKf45_Func_Ct.vi Removed. Replaced with newer functions. NumIntegrate_Rkf45_Impl.vi $X \mid X$ No I X Χ X NumIntegrate_Rkf45_Mat_X_U.vi Note that this Feinberg method has been changed and a Dormand Price method has been implemented...TODO

Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. NumIntegrate RKf45 New.vi Removed. Never used X X X X SI NumIntegrate_Trap_Dbl.vi X X X X I NumIntegrate_Trap_Mat.vi Menu Item VI Name Function Prototype Notes RUNGE KUTTA TIME VARYING X X No RungeKuttaTimeVarying RK4 Mat T Y.vi Function Prototype Notes NUMERICAL JACOBIAN X X NumJacobian U.vi Χ $X \mid X$ X NumJacobian X.vi Function Prototype Notes RICCATI X Riccati Check Detectable.vi X Routine exists, it is just a shell X Riccati_Check_Stabilizable.vi Χ Not really done !!! Χ Χ X X X X Riccati DARE Iterate.vi X XX Χ Riccati_DARE_StructDoubling.vi Χ X Χ Riccati DARE N.vi Riccati DARE.vi Χ X X Riccati Input Check.vi Χ X '======= VISION '======== Menu Item Function Prototype Notes COMPUTER VISION UTILITIES X CompVisionUtil CalculateDistanceToTarget.vi Χ X X X CompVisionUtil_EstimateCameraToTarget.vi X X CompVisionUtil_EstimateFieldToCamera.vi X X X X CompVisionUtil_EstimateFieldToRobot.vi X X X CompVisionUtil EstimateFieldToRobot Alt.vi

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

| | ted | ted | B | - | Optimized | ine | Program | | | |
|-----------|-------------|------------|---------------------|-----------|------------|--------------|---------|---|--------------------|--|
| | Implemented | Documented | Not WPILIB | Menu Item | Execution | Test Routine | mple | VI Name | Cunction Prototype | Nata |
| TypeDef | | X | <u><</u> | - X | N/A | _ | 0) | ARM FF.CTL | Function Prototype | Notes |
| . , poso. | Z | X | X | X | N/A | | | BANG BANG.CTL | | |
| | 1 | | Χ | X | N/A | | | BICon-Matrix_FUNC_TYPE.CTL | | NOT USED. Should this be |
| | _ | | | | | | | | | deleted or abandoned??? |
| - | Z | X | X | X | N/A | | | CALLBACK_FUNC_TYPE.CTL | | |
| - | Z Z | X | X | X | N/A N/A | | | CHASSIS_SPEEDS.CTL CONTRAINED_STATE.CTL | | |
| | Z | X | \overline{X} | X | N/A N/A | | | COORDINATE AXIS.CTL | | |
| | Z | X | X | X | N/A | | | COORDINATE SYSTEM.CTL | | |
| | Ζ | X | X | X | N/A | | | DCMOTOR TYPES ENUM.CTL | | |
| | Ζ | X | Χ | X | N/A | | | DCMOTOR.CTL | | |
| | Ζ | Χ | Χ | X | N/A | | | DCMOTOR_SIM.CTL | | |
| | Z | X | X | X | N/A | | | DEBOUNCER_TYPE_ENUM.Ctl | | |
| } | Z | X | X | X | N/A N/A | | | DEBOUNCER.CTL DIFF DRIVE ACCEL LIMIT.CTL | | |
| } | Z | X | X | X | N/A N/A | | | DIFF_DRIVE_ACCEL_LIMIT.CTL DIFF_DRIVE_KINEMATICS.CTL | | |
| - | Z | X | X | X | N/A | | | DIFF DRIVE Kitbot WheelSize ENUM.ctl | | |
| | Ζ | X | X | X | N/A | | | DiFF DRIVE Pose EST.ctl | | |
| | Ζ | X | Χ | Χ | N/A | | | DIFF_DRIVE_ToughBoxMini_GearChoice_ENUM.ctl | | |
| | Ζ | X | Χ | X | N/A | | | DIFF_DRIVE_ToughBoxMini_MotorChoice_ENUM.ctl | | |
| - | Z | X | X | X | N/A | | | DIFF_DRIVE_TRAIN_SIM_STATE_ENUM.CTL | | |
| - | Z Z | X | X | X | N/A NA | | | DIFF_DRIVE_TRAIN_SIM.ctl DISPLAY_WAYPOINT.ctl | | Was UTIL WAYPOINT.VI |
| - | Z | X | X | X | NA | | | DISPLAY_WEIGHTED_WAYPOINT.ctl | | New V1.5. was UTIL_WEIGHTED_WAYPOINIT.VI |
| - | Ζ | X | Χ | X | N/A | | | ELEV_FF.CTL | | |
| | Ζ | X | Χ | X | N/A | | | ELEVATOR_SIM.CTL | | |
| - | Z Z | Х | X | X | N/A N/A | | | EXTENDED_KALMAN_CORRECT_FUNC_GROUP.CTL EXTENDED KALMAN FILTER.CTL | | |
| | Z | Х | X | X | N/A N/A | | | FLYWHEEL SIM.ctl | | |
| | Z | X | X | X | N/A | | | FUNCTION GENERATOR.ctl | | |
| | Ζ | Χ | Χ | X | N/A | | | FUNCTION_GENERATOR_MATRIX.ctl | | |
| | Ζ | X | Χ | Χ | N/A | | | HOLONOMIC_DRV_CTRL.CTL | | New 1/26/21 |
| | Z | X | X | X | N/A | | | TIME_INTERPOLATABLE_BOOLEAN.CTL | | |
| - | Z Z | X | X | X | N/A N/A | | | TIME_INTERPOLATABLE_DOUBLE.CTL TIME_INTERPOLATABLE_POSE2D.CTL | | |
| | Z | X | | | N/A N/A | | | TIME INTERPOLATABLE POSEZD.CTL TIME INTERPOLATABLE ROTATION2D.CTL | | |
| | Z | X | X | X | N/A | | | KALMAN FILTER LATENCY COMP FUNC GROUP.CTL | | |
| | Ζ | Χ | Χ | Χ | N/A | | | KALMAN_FILTER_LATENCY_COMP.CTL | | |
| | Ζ | X | Χ | Χ | N/A | | | KALMAN_FILTER.ctl | | |
| - | Z | X | X | X | N/A | | | LINEAR_FILTER.CTL | | |
| | Z Z | X | X | X | N/A N/A | | | LINEAR_PLANT_INV_FF.ctl LINEAR_QUADRATIC_REGULATOR.ctl | | |
| | Z | X | X | X | N/A N/A | | | LINEAR SYSTEM LOOP.ctl | | |
| | Z | X | X | X | N/A | | | LINEAR SYSTEM SIM.ctl | | |
| | Ζ | X | Χ | X | N/A | | | LINEAR_SYSTEM.ctl | | |
| | Ζ | | Χ | Χ | N/A | | | LTV_DIFF_DRIVE_CTRL.ctl | | |
| | Z | | Χ | X | N/A | | | LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl | | |
| - | Z | | X | X | N/A | | | LTV_UNICYCLE_CONTROLLER.CTL | | |
| } | Z Z | | X | X | N/A N/A | | | LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl | | |
| - | Z | Х | X | X | N/A | | | MECA DRIVE KINEMATICS.CTL | | |
| ļ | Z | X | X | X | N/A | | | MECA_DRIVE_ODOMETRY.CTL | | |
| | Ζ | | Χ | X | N/A | | | MECA_DRIVE_POSE_EST.CTL | | |
| | Z | X | X | X | N/A | | | MECA_WHEEL_SPEEDS.CTL | | |
| } | Z | X | X | X | N/A | | | MEDIAN_FILTER.CTL | | |
| } | Z | X | X | X | N/A N/A | | | MERWE_SCALED_SIGMA_PTS.ctl OBSERVER_SNAP_LIST_ITEM.CTL | | |
| | Z | X | $\frac{\lambda}{X}$ | X | N/A N/A | | | OBSERVER_SNAPSHOT.CTL | | |

| e interp | olatabl | e routi | ines. | | | |
|----------|---------|---------|-------|-----|---|------------------------------------|
| Z | X | Χ | Χ | N/A | PARAM STACK ITEM.CTL | |
| Z | X | Χ | Χ | N/A | PARAM STACK.CTL | |
| Z | Χ | Χ | Χ | N/A | PID ADV LIMITS.CTL | |
| Z | Χ | Χ | X | N/A | PID ADV TUNING.CTL | |
| Z | Χ | X | X | N/A | PID CONTROLLER.CTL | |
| Z | X | X | X | N/A | PID ERROR TOLERANCE.CTL | |
| Z | X | X | X | N/A | PID INPUT LIMITS.CTL | |
| Z | X | X | X | N/A | PID TUNING.CTL | |
| Z | X | X | X | N/A | POSE2D.CTL | |
| Z | X | X | X | N/A | POSE3D.CTL | |
| Z | X | X | X | N/A | POSEwCURVATURE.CTL | |
| Z | X | X | X | N/A | PROFILED PID CONTROLLER.CTL | |
| Z | X | X | X | N/A | QUATERNION.CTL | |
| Z | X | X | X | N/A | RAMSETE EXE TUNING.CTL | |
| Z | X | X | X | N/A | RAMSETE.CTL | |
| Z | X | X | X | N/A | ROTATION2D.CTL | |
| Z | X | X | X | N/A | ROTATION3D.CTL | |
| Z | X | X | X | N/A | SIMPLE MOTOR FF.CTL | |
| Z | X | X | X | N/A | SINGLE JOINT ARM SIM.CTL | |
| Z | X | X | X | N/A | SLEW RATE LIMITER.CTL | |
| Z | X | X | X | N/A | SPLINE CTRL VECTOR.CTL | |
| Z | X | X | X | N/A | SPLINE.CTL | |
| Z | X | X | X | N/A | SWERVE DRIVE KINEMATICS.CTL | |
| Z | X | X | X | N/A | SWERVE DRIVE MODULE STATE.CTL | |
| Z | X | X | X | N/A | SWERVE DRIVE ODOMETRY.CTL | |
| Z | X | X | X | N/A | SWERVE DRIVE Pose EST.CTL | |
| Z | X | X | X | N/A | TIMER.CTL | |
| Z | X | X | X | N/A | TRAJ CONFIG.CTL | |
| Z | X | X | X | N/A | TRAJ CONSTRAINT CENTRIPETAL ACCEL.CTL | |
| Z | X | X | X | N/A | TRAJ CONSTRAINT DIIF DRIVE KINEMATICS.CTL | |
| Z | X | X | X | N/A | TRAJ_CONSTRAINT_DIIF_DRIVE_VOLTAGE.CTL | |
| 1 | - / / | X | - 1 | N/A | TRAJ CONSTRAINT JERK.CTL | Routine exists, it is just a shell |
| Z | Χ | X | Χ | N/A | TRAJ CONSTRAINT MECA DRIVE KINEMATICS.CTL | , |
| Z | X | X | X | N/A | TRAJ CONSTRAINT MINMAX.CTL | |
| Z | X | Χ | X | N/A | TRAJ CONSTRAINT SWERVE DRIVE KINEMATICS.CTL | |
| Z | X | X | X | N/A | TRAJ STATE.CTL | |
| Z | X | X | X | N/A | TRAJECTORY SPLINE TYPE ENUM.CTL | |
| Z | X | X | X | N/A | TRAJECTORY.CTL | |
| Z | X | X | X | N/A | TRANSFORM2D.CTL | |
| Z | X | X | X | N/A | TRANSFORM3D.CTL | |
| Z | X | X | X | N/A | TRANSLATION2D.CTL | |
| Z | X | X | X | N/A | TRANSLATION3D.CTL | |
| Z | X | X | X | N/A | TRAPEZOID PROFILE CONSTRAINT.CTL | |
| Z | X | Χ | | N/A | TRAPEZOID_PROFILE_STATE.CTL | |
| Z | X | X | X | N/A | TRAPEZOID PROFILE.CTL | |
| Z | X | X | X | N/A | TWIST2D.CTL | |
| Z | X | X | X | N/A | TWIST3D.CTL | |
| Z | X | X | X | N/A | UNSCENTED KALMAN CORRECT FUNC GROUP.CTL | |
| Z | X | X | X | N/A | UNSCENTED KALMAN FILTER.ctl | |
| Z | X | X | X | N/A | UNSCENTED KALMAN NEW FUNC GROUP.CTL | |
| Z | X | X | X | N/A | UTIL PATHFINDER CONFIG.CTL | |
| N/A | | N/A | - N | N/A | WAYPOINTS.CTL | Delete – obsolete |
| Z | Χ | X | Χ | NA | WEIGHTED WAYPOINT.CTL | New V1.5 |
| N/A | | N/A | | N/A | X Y HEADINGS.CTL | Delete – obsolete |
| Z | Х | X | Χ | N/A | X Y PAIR.CTL | |
| | - • | ٠, | - • | | | |