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

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

Doc completed Pct 86.14% Optimization Pct 55.04%

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

'===== BASE

'=======

| FUNCTION GENERATOR X X X X X X X X X X X X X X X X X X X | X X I X X X I X X X I X X I X X X I X X X I X X X I X X X I X X X I X X X I X X X I X X X I X X X I X X X I X X X I X X X I X X X I X X X X I X X X X I X X X X I X | | F F F | /I Name | 71 | Notes Similar to interpolated tree map | Code Review | Test Program | Error Checking |
|--|---|------------|-------------|---|--------------------|--|-------------|--------------|----------------|
| FUNCTION GENERATOR MATRIX X X X X X X X X X X X X X X X X X X | X Menu Item I Execution Optimized | Test Routi | F | /I Name FunctionGeneratoMatrixr_Add.vi FunctionGenerator_Calculate.vi FunctionGenerator_New.vi | , | Notes Similar to interpolated tree map Similar to interpolated tree map Similar to interpolated tree map | Code Review | Test Program | Error Checking |
| X / Implemented X X / Not WPILIB | X Menu Item | | L | _inearFilter_BackwardFiniteDifference.vi | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| | X Si | | | _inearFilter_Calculate.vi _inearFilter_CutoffFrequency.vi | | | | | |
| | X X X | | | inearFilter_CutoffFrequency.vi LinearFilter_Execute.vi | | Labview style helper | | | |
| | No I | | | LinearFilter Factorial.vi | | AN INTERNAL ROUTINE | | + | |
| $\begin{array}{c c} x & x \\ \hline x & x \\ \hline \end{array}$ | XX | | | LinearFilter_HighPass.vi | | | | | |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | XX | | | LinearFilter_HighPassBW1.vi | | | | | |
| X X X | XX | | L | _inearFilter_HighPassBW2.vi | | | | | |
| X X X | XX | | L | _inearFilter_LowPassBW1.vi | | | | | |
| X X X | XX | | L | inearFilter_LowPassBW2.vi | | | | | |

FRC_LabVIEW_Trajectory_Library_Routines.xlsx

| abVIEW Trajectory Library – VI Implementation | | | - | | | | | | | |
|--|---|--|--|----------------|---|---|--|-------------|-----------------------|--|
| 2.X 5/2/2022 – added implicit model follower and tim | | | | | | | | | | |
| | XX | | XX | | LinearFilter_MovingAverage.vi | | | | | |
| | XX | | X | | LinearFilter_New.vi | | | | | |
| | XX | | X SI | | LinearFilter_Reset.vi | | | | | |
| | | X | | | LinearFilter_ResetToValue.vi | | | | | |
| | X X | | X X | | LinearFilter_SinglePoleIIR.vi | | | | | |
| | XX | X | XX | | LinearFilter_TimeConst.vi | | | | | |
| | Implemented Documented | Not WPILIB | Menu Item Execution Optimized | Test Routine | VI Name Function I | n Prototype No | ıtes | Code Review | Test Program | Error Checking |
| MEDIAN FILTE | | | XX | | MedianFilter Calculate.vi | 71 | | | | |
| | XX | X | X | | MedianFilter_Execute.vi | La | bview style helper | | | |
| | XX | | X SI | | MedianFilter_New.vi | | · | | | |
| | XX | | X SI | | MedianFilter_Reset.vi | | | | | |
| | XX | X | X SI | | MedianFilter_ResetToValue.vi | | | | | |
| | ented ented | WPILIB | ltem rtion Optimized | Test Routine | | | | Code Review | ogram | |
| | in an | Š | utíc utíc | Bo. | | | | Ř | Pro | 5 |
| | mplemen | Not v | Menu Execu | Test Ro | | | | ge | st | Š |
| | | | | | | n Prototype No | tes | _ၓ | | Ţ, |
| SLEW RATE FILTE | | | X | | SlewRateLimiter_Calculate.vi | | | | | |
| | XX | X | X SI | | SlewRateLimiter_Close.vi | | | | | |
| | XX | | X I | | SlewRateLimiter_Execute.vi | La | bview style helper | | | |
| | XX | | X SI | | SlewRateLimiter_GetRate.vi | | | | | |
| | XX | | X I | | SlewRateLimiter_New.vi | | | | | |
| | XX | | X | | SlewRateLimiter_NewInitialZero.vi | | | I . | | |
| | | | | | | | | | | |
| | X X X X | | X I X SI | | SlewRateLimiter_Reset.vi SlewRateLimiter_SetRate.vi | | | | | |
| | mented X | ыгів | Item X X Item X Item Optimized IS | Rol | SlewRateLimiter_SetRate.vi | | | de Review | st Program | or Checking |
| | Implemented X Documented X | Not WPILIB | Menu Item X Execution Optimized 19 | Test Routine | SlewRateLimiter_SetRate.vi VI Name Function I | | ıtes | Code Review | Test Program | Error Chacking |
| TIME | X Mplemented X X Documented X X X X X X X X X | X Not WPILIB | X Menu Item X Execution Optimized 19 | Test Rou | SlewRateLimiter_SetRate.vi VI Name Function I Timer Close.vi | | ites eases semaphore | • | Test Program | Error Checking |
| TIME | X X Implemented X X X Documented | X Not WPILIB | X Menu Item Execution Optimized IS | Test Rou | SlewRateLimiter_SetRate.vi VI Name Function I Timer_Close.vi Timer_Get.vi | | | • | Test Program | seistond roan |
| TIME | X X Implemented X X X X X X X X X X X X X X X X X X X | X Not WPILIB | X X Menu Item Execution Optimized IS | Test Rou | SlewRateLimiter_SetRate.vi VI Name Function I Timer_Close.vi Timer_Get.vi Timer_GetAndReset.vi | rel | eases semaphore | • | Test Program | |
| TIME | X X X X X X X X X X X X X X X X X X X | X Not WPILIB | X X Menu Item Execution Optimized IS | Test Rou | SlewRateLimiter_SetRate.vi VI Name Function I Timer_Close.vi Timer_Get.vi Timer_GetAndReset.vi Timer_GetInternal.vi | rel | | • | Test Program | |
| TIME | X X X X X X X X X X X X X X X X X X X | X Not WPILIB | X Menu Item X X X Menu Item Execution Optimized | Test Rou | SlewRateLimiter_SetRate.vi VI Name Function I Timer_Close.vi Timer_Get.vi Timer_GetAndReset.vi Timer_GetInternal.vi Timer_HasPeriodPassed.vi | rel | eases semaphore | • | Test Program | |
| TIME | X X X X X X X X X X X X X X X X X X X | X Not WPILIB | X Non X X Menu Item X X Execution Optimized IS | Test Rou | SlewRateLimiter_SetRate.vi VI Name Function I Timer_Close.vi Timer_Get.vi Timer_GetAndReset.vi Timer_GetInternal.vi Timer_HasPeriodPassed.vi Timer_HasPeriodPassedOnce.vi | rel | eases semaphore | • | Test Program | Z (1) C (4) |
| TIME | X X X X X X X X X X X X X X X X X X X | X Not WPILIB | X Non X X Wenu Item X X X X X X X X X X X X X X X X X X X | Test Rou | SlewRateLimiter_SetRate.vi VI Name Function I Timer_Close.vi Timer_Get.vi Timer_GetAndReset.vi Timer_GetInternal.vi Timer_HasPeriodPassedOnce.vi Timer_New.vi | rel | eases semaphore | • | Test Program | 7 C C C C C C C C C C C C C C C C C C C |
| TIME | X | X Not WPILIB | X Menu Item X X X X X X X X X X X X X X X X X X X | Test Rou | SlewRateLimiter_SetRate.vi VI Name Function I Timer_Close.vi Timer_Get.vi Timer_GetAndReset.vi Timer_GetInternal.vi Timer_HasPeriodPassedOnce.vi Timer_HasPeriodPassedOnce.vi Timer_New.vi Timer_Reset.vi | rel Int | eases semaphore ernal (private) only | • | Test Program | |
| TIME | X | X Not WPILIB | X Menu Item X X X X X X X X X X X X X X X X X X X | Test Ro | SlewRateLimiter_SetRate.vi VI Name Function I 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 | rel Int | eases semaphore | • | Test Program | Drived Charling |
| TIME | X | X Not WPILIB | X Menu Item X X No X X X X X X X X X X X X X X X X X | Test Ro | SlewRateLimiter_SetRate.vi VI Name Function I 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_ResetInternal Timer_Start.vi | rel Int | eases semaphore ernal (private) only | • | Test Program | و وزیار در در از |
| TIME | X | X Not WPILIB | X Wenu Item X X No X X X X X X X X X X X X X X X X X | Test Ro | SlewRateLimiter_SetRate.vi VI Name Function I 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_ResetInternal Timer_Start.vi Timer_Stop.vi | rel Int | ernal (private) only ernal (private) only | • | Test Program | |
| TIME | X | X Not WPILIB | X Wenu Item X X No X X X X X X X X X X X X X X X X X | Test Ro | SlewRateLimiter_SetRate.vi VI Name Function I 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_ResetInternal Timer_Start.vi | rel Int | eases semaphore ernal (private) only | • | Test Program | : |
| TIME | X | X Not WPILIB | No X X X Noo X Noo X X Noo X X Noo X Noo X Noo X X Noo X Noo X X Noo X Noo X Noo X X Noo X Noo X Noo X Noo X X Noo X | Test Rou | VI Name Function I Timer_Close.vi Timer_Get.vi Timer_GetAndReset.vi Timer_GetInternal.vi Timer_HasPeriodPassed.vi Timer_New.vi Timer_Reset.vi Timer_Reset.vi Timer_Reset.vi Timer_Start.vi Timer_Stop.vi Timer_StopInternal.vi | rel Int | ernal (private) only ernal (private) only | Code | igram Test Program | ممتزاهم |
| TIME | mented mented X X X X X X X X X X X X X X X X X X X | WILIB X X X X | Item N | Test Rou | VI Name Function I Timer_Close.vi Timer_Get.vi Timer_GetAndReset.vi Timer_GetInternal.vi Timer_HasPeriodPassed.vi Timer_New.vi Timer_Reset.vi Timer_Reset.vi Timer_Reset.vi Timer_Start.vi Timer_Stop.vi Timer_StopInternal.vi | rel Int | ernal (private) only ernal (private) only | Code | Program Test Program | Checkina Error Checkina |
| TIME | mented mented X X X X X X X X X X X X X X X X X X X | WPILIB X X X X X X X X X X X X X X X X X X X | Item N | Test Rou | SlewRateLimiter_SetRate.vi VI Name Function I 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_ResetInternal Timer_ResetInternal Timer_Start.vi Timer_Stop.vi Timer_StopInternal.vi | rel Int | ernal (private) only ernal (private) only ernal (private) only ernal (private) only | Code | st Program | ror Checking Error Checking |
| | Implemented X X X X X X X X X X X X X X X X X X X | Not WPILIB X X X | Menu Item Na X X No X X X Menu Item X X No X X X Menu Item X Execution Optimized IS Execution Optimized | utine Test Roi | SlewRateLimiter_SetRate.vi VI Name Function I 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_ResetInternal Timer_Start.vi Timer_Stop.vi Timer_StopInternal.vi VI Name Function I | Int Int Int | ernal (private) only ernal (private) only ernal (private) only ernal (private) only | • | Program | Error Checking |
| TIME INTERPOLATABLE BOOLEA | X X X X X X X X X X | X Not WPILIB | X Menu Item NX X X NO X X X X | Test Rou | SlewRateLimiter_SetRate.vi VI Name Function I 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_Start.vi Timer_Stop.vi Timer_Stop.ni Timer_StopInternal.vi | Int | ernal (private) only ernal (private) only ernal (private) only ernal (private) only ernal (private) only | Code | st Program | or Checking |
| | Implemented 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 Menu Item NX X X NO X X X X | Test Rou | SlewRateLimiter_SetRate.vi VI Name Function I 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_ResetInternal Timer_Start.vi Timer_Stop.vi Timer_StopInternal.vi VI Name Function I | Int | ernal (private) only ernal (private) only ernal (private) only ernal (private) only | Code | st Program | or Checking |

| 2/2022 – added implicit model follower and time | interpola | atable ro | outines | S. | | | | - | | | | |
|---|-------------|----------------------------|---|-------------|--------------|-------------|-----------------------------------|--------------------|-----------------------------|------------|--------------|------------|
| auduup | | | () X | | | | TimeInterpBoolean_GetSample.vi | | | | | |
| | X | X | (X | (| | | TimeInterpBoolean_New.vi | | | | | |
| | | | | | | | <u> </u> | | - | | | |
| | | | | þ | | | | | | | | |
| | | | | λįζ | | 2 | | | | | | |
| | | | | tin | | rar | | | | | ~ | бı |
| | pə. | ed B | _ د | Optir | ne | 60. | | | | e. E. | au | Ϋ́ |
| | Implemente | Documente | Meni Item | 5 6 | Test Routine | ď | | | | e N | <i>l</i> bc | . Checking |
| | Ĕ | Ĕ Ş | : = | ŧ, | Bo | a/a | | | | Œ | Ţ | Ö |
| | ble | 7 7 | , 2 | Execution | st | Sample | | | | Code Rev | Test Prog | Error |
| | | | | E W | <u>~</u> | Š | VI Name | | Notes | Ŭ | | <u> </u> |
| TIME INTERPOLATABLE DOUBLE | X | Χ | | | | | TimeInterpDouble_AddSample.vi | | Update to use create matrix | | | |
| | X | Χ | | | | | TimeInterpDouble_CleanUp.vi | | Update to use create matrix | | | |
| | X | Χ | | | | | TimeInterpDouble_Clear.vi | | | | | |
| | X | Χ | | (| | | TimeInterpDouble_GetSample.vi | | | | | |
| | X | Χ | | (| | | TimeInterpDouble_New.vi | | | | | |
| | | | • | • | • | | <u> </u> | | | | • | |
| | | | | 96 | | | | | | | | |
| | | | | jζ | | 2 | | | | | | |
| | | | | ţi | | ran | | | | | ~ | g |
| | eq | B @ | 1 | ိ | 2 6 | ò | | | | ě | an | . Checking |
| | ent | int. | 1 8 | 5 5 | Cŧi | ď | | | | e N. | gc | Je |
| | Ĕ | ž ž | : = | ž ž | 8 | e)e | | | | œ | P. | \ddot{o} |
| | Implementec | Documente | | Execution | Test Routine | Sample | | | | Code Revie | Test Program | Ď |
| | | | Men Item | Ш | <u>1</u> e | Sa | VI Name | Function Prototype | Notes | ပိ | <u> 7</u> e | Error |
| TIME INTERPOLATABLE POSE2D | X | Χ | (X | (| | | TimeInterpPose2d_AddSample.vi | | Update to use create matrix | | | |
| | X | Χ | (N | o | | | TimeInterpPose2d_CleanUp.vi | | Update to use create matrix | | | |
| | Χ | Χ | | | | | TimeInterpPose2d Clear.vi | | | | | |
| | X | Х | | | | | TimeInterpPose2d_GetSample.vi | | | | | |
| | X | Х | | | | | TimeInterpPose2d_New.vi | | | | | |
| | | | | | | | <u> </u> | | | | 1 | |
| | | | | ized | | _ | | | | | | |
| | | | | tin | | an | | | | | | 9 |
| | ğ | , g | | , ido | e | ğ | | | | Š | THE | kin |
| | nte | nte I I | 3 5 | | Zŧi | Pro | | | | Reviev | gre | o G |
| | ше | Documente | . # | 記録 | Test Routine | Sample Prog | | | | æ | Progr | . Checking |
| |)e | in S | . 3 | g 5 | st F | пр | | | | ge | st F | <i>.</i> 0 |
| | Implementec | Documente | Meni Item | Execution (| Ţe | Sa | VI Name | Function Prototype | Notes | Code | Test | Error |
| TIME INTERPOLATABLE ROTATION2D | X | X | $\langle \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$ | | | | TimeInterpRotation2d_AddSample.vi | | Update to use create matrix | | | |
| | X | Х | | | | | TimeInterpRotation2d_CleanUp.vi | | Update to use create matrix | | | |
| | X | Х | | (| | | TimeInterpRotation2d_Clear.vi | | • | | | |
| | X | X | | | | | TimeInterpRotation2d_GetSample.vi | | | | | |
| | X | X | | | | | TimeInterpRotation2d_New.vi | | | | | |
| | 7. | | | • | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | Ø | | | | | | | | |
| | | | | ize | | _ | | | | | | |
| | | | | <u>#</u> | | an | | | | | | Ø |
| | Þ | m @ | | D D | e | g | | | | × | E E | kin |
| | nte | nte | } | - | ξį | P | | | | ,Š | gr | ၁ |
| | ше | ae d | i 4 | Execution | Test Routine | e/e | | | | Code Revie | 22 | Checking |
| | ible. | 3 5 | . 3 | 5 5 6 | st I | ш | | | | de | st I | o. |
| | Ē | Docume Not WP | Menu | Š | je 1 | Sample | VI Name | Function Prototype | Notes | ပိ | je 1 | Error |
| DIGITAL SEQUENTIAL LOGIC | X | XX | | | | | DigSeqLogic_On_Delay.vi | | | | | |
| | | X X | | | | | DigSeqLogic_Off_Delay.vi | | | | | |
| | X | X X | | | | | DigSeqLogic_One_Shot.vi | | | | | |
| | | X X | | | | | DigSeqLogic_SR_Flip_Flop.vi | | | | | |
| | | | <u> </u> | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | σ | | | | | | | | |
| | | | | ž. | | _ | | | | | | |
| | | | | <u>.</u> E | | au | | | | | | Ø |
| | þ | ~ g | | Opt | ō | gr | | | | λ | E E | Checking |
| | nte | nte | 3 1 | | ıţin | P_{CC} | | | | , vie | grė | eci |
| | ше | Documen Not WPII | . 4 | Execution | Test Routine | l əldı | | | | Revie | 20 | ક |
| | Impleme | 3 3 | | ž Ž | st F | ďπ | | | | ge | st f | |
| | ţw, | Docume Not WPI | Menu Iter | | Ţĕ, | San | VI Name | Function Prototype | Notes | Code | ĕ | Error |
| DEBOUNCER | | \overline{X} | $\frac{1}{\lambda}$ | | | ·, | Debouncer New.vi | | | | · | |
| 222376210 | | X | $\frac{1}{\lambda}$ | | | | Debouncer_Calculate.vi | | | | | |
| | X | $\stackrel{\wedge}{X}$ X | $\frac{1}{x}$ | | | | Debouncer Execute.vi | | | | | |
| | | <u> </u> | ^ | ` | | | DOSCULTOOI_EXCOULO.VI | 1 | | | | |

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

| X | X | No | | Debouncer_Reset.vi | | | |
|---|---|----|--|-------------------------|--|--|--|
| X | X | No | | Debouncer_HasElapsed.vi | | | |
| | | | | | | | |

'======== CONTROLLER '========

| | | | | | | | | | • | | | | |
|-----------------|-----------------|----------------|--------------|---------------------|---------------------|--------------|----------------|---|---------------------|--|-------------|--------------|----------------|
| ARM FF | X Implemented | X Documented | Not WPILIB | X | Execution Optimized | Test Routine | Sample Program | ArmFF_Calculate.vi | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| | Χ | Χ | | X | | | | ArmFF_CalculateVelocityOnly.vi | | | | | |
| | | | X | | | | | ArmFF_Execute.vi | | LabVIEW style single call | | | |
| | X | Х | X | X | | | | ArmFF_ExecuteVelocityOnly.vi ArmFF MaxAchieveAccel.vi | | LabVIEW style single call | | | |
| | X | X | | $\frac{\lambda}{X}$ | | | | ArmFF_MaxAchieveVelocity.vi | | + | | | |
| | X | X | | X | | | | ArmFF MinAchieveAccel.vi | | | | | |
| | Χ | X | | X | | | | ArmFF_MinAchieveVelocity.vi | | | | | |
| | Χ | Χ | | X | | | | ArmFF_New_ZeroGravity.vi | | | | | |
| | Χ | X | | X | | | | ArmFF_New.vi | | | | | |
| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | N/I NI area | Forestion Destators | Notes | Code Review | Test Program | Error Checking |
| DANC DANC | <u> </u> | | Ž | <u> </u> | | <u> </u> | _ ∖ÿ | | Function Prototype | Notes | Ŭ | <u> </u> | Ш. |
| BANG BANG | X | X | | X | SI | | | BangBang_AtSetpoint.vi BangBang_Calculate_PV.vi | | | | | |
| | \dot{X} | X | | $\frac{\lambda}{X}$ | SI | | | BangBang_Calculate_SP_PV.vi | | + | | | |
| | X | X | X | | SI | | | BangBang_Execute.vi | | | | | |
| | Χ | X | | X | SI | | | BangBang_GetAll.vi | | | | | |
| | Χ | Χ | | X | SI | | | BangBang_GetError.vi | | | | | |
| | Χ | X | | X | | | | BangBang_New.vi | | | | | |
| | X | X | | X | SI | | | BangBang_SetSetpoint.vi | | | | | |
| | Χ | X | | X | SI | | | BangBang_SetTolerance.vi | | | | | |
| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| CONTROLLER UTIL | X | X | | X | SI | | | ControllerUtil_GetModulusError.vi | | This was short lived in WPILIB, but still useful here. | | | |
| ELEV FF | X X Implemented | X X Documented | X Not WPILIB | | Execution Optimized | Test Routine | Sample Program | ElevFF_Calculate.vi ElevFF_CalculateVelocityOnly.vi ElevFF_Execute.vi | Function Prototype | Notes LabVIEW style single call | Code Review | Test Program | Error Checking |
| | | | X | | | | | ElevFF_ExecuteVelocityOnly.vi | | LabVIEW style single call | | | |
| | Χ | X | | X | | | | ElevFF_MaxAchieveAccel.vi | | | | | |

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

| time interpolatable | routine | S. | | |
|---------------------|---------|----------|--------------|----------------------------|
| XX | , | (| Elev | evFF_MaxAchieveVelocity.vi |
| XX | | (| Elev | evFF_MinAchieveAccel.vi |
| XX | | (| Elev | evFF_MinAchieveVelocity.vi |
| XX | , | (| Elev | evFF_New_ZeroAccel.vi |
| XX | , | < | Elev | evFF_New.vi |
| | | | | |
| | | | Q | |

| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine Sample Program | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
|--------------|-------------|------------|------------|-----------|---------------------|--------------------------------|---------------------------------------|--------------------|-----------------|-------------|--------------|----------------|
| HOL_DRV_CTRL | Χ | Χ | Χ | Χ | | | HolDrvCtrl_AdvCalculate_Trajectory.vi | | Added 1/24/2022 | | | |
| | Χ | X | X | Χ | | | HolDrvCtrl_AdvCalculate.vi | | Added 1/24/2022 | | | |
| | Χ | X | | Χ | SI | | HolDrvCtrl_AtReference.vi | | Added 1/26/21 | | | |
| | Χ | X | | Χ | - 1 | | HolDrvCtrl_Calculate_Trajectory.vi | | Added 1/26/21 | | | |
| | Χ | X | | Χ | - 1 | | HolDrvCtrl_Calculate.vi | | Added 1/26/21 | | | |
| | Χ | X | Χ | Χ | | | HolDrvCtrl_Execute_Trajectory.vi | | Added 1/24/2022 | | | |
| | Χ | X | X | Χ | | | HolDrvCtrl_Execute.vi | | Future | | | |
| | Χ | X | | Χ | SI | | HolDrvCtrl_New.vi | | Added 1/26/21 | | | |
| | Χ | X | Χ | Χ | SI | | HolDrvCtrl_PackExecuteSP.vi | | | | | |
| | Χ | X | X | Χ | | | HolDrvCtrl_PackPID.vi | | Added 1/24/2022 | | | |
| | Χ | X | X | Χ | | | HolDrvCtrl_PackProfPID.vi | | Added 1/24/2022 | | | |
| | Χ | Χ | | Χ | SI | | HolDrvCtrl_SetEnabled.vi | | Added 1/26/21 | | | |
| | X | Χ | | Χ | SI | | HolDrvCtrl_SetTolerance.vi | | Added 1/26/21 | | | |

| | Implemented | . Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | NI Name Program | Function Prototype | Notes | Code Review | Test Program | Error Checking |
|----------------|-------------|--------------|------------|-----------|---------------------|--------------|---|--------------------|------------------------------------|-------------|--------------|----------------|
| PID CONTROLLER | | | X | Χ | | | PIDController_AdvCalculate_FF_Sp_Pv_Per.vi | | Advanced PID | | | |
| | X | Χ | Χ | Χ | | | PIDController_AdvCalculate_FF_Sp_Pv.vi | | Advanced PID | | | |
| | X | X | X | X | | | X PIDController_AdvExecute.vi | | Labview style helper. Advanced PID | | | |
| | X | X | | Χ | SI | | PIDController_AtSetpoint.vi | | | | | |
| | X | X | | Χ | | | PIDController_Calculate_PV.vi | | | | | |
| | X | X | | Χ | | | PIDController_Calculate_SP_PV.vi | | | | | |
| | Χ | Χ | | Χ | SI | | PIDController_DisableContinousInput.vi | | | | | |
| | Χ | Χ | | Χ | SI | | PIDController_EnableContinousInput.vi | | | | | |
| | X | X | Χ | Χ | | | X PIDController_Execute.vi | | Labview style helper | | | |
| | | | | | | | PIDController_GetContinuousError.vi | | OBSOLETE – Removed | | | |
| | Χ | Χ | | Χ | SI | | PIDController_GetPeriod.vi | | | | | |
| | Χ | Χ | | Χ | SI | | PIDController_GetPID.vi | | | | | |
| | Χ | Χ | | Χ | SI | | PIDController GetPositionError.vi | | | | | |
| | Χ | Χ | | Χ | SI | | PIDController GetSetpoint.vi | | | | | |
| | Χ | Χ | | Χ | SI | | PIDController_GetVelocityError.vi | | | | | |
| | Χ | Χ | | Χ | SI | | PIDController IsContinuousInputEnabled.vi | | | | | |
| | Χ | Χ | | Χ | 1 | | PIDController New.vi | | | | | |
| | Χ | Χ | | Χ | 1 | | PIDController NewPeriod.vi | | | | | |
| | Χ | Χ | Χ | Χ | SI | | PIDController Pack AdvLimits.vi | | | | | |
| | Χ | Χ | Χ | X | SI | | PIDController_Pack_AdvTuning.vi | | | | | |
| | Χ | Χ | Χ | X | SI | | PIDController Pack ErrorTolerance.vi | | | | | |
| | Χ | X | Χ | X | SI | | PIDController_Pack_InputLimits.vi | | | | | |
| | Χ | | Χ | Χ | SI | | PIDController Pack Tuning.vi | | | | | |
| | Χ | Χ | | Χ | SI | | PIDController Reset.vi | | | | | |
| | Χ | X | | X | SI | | PIDController SetD.vi | | | | | |
| | X | | X | X | SI | | PIDController SetDerivativeFilter.vi | | Advanced PID | | | |
| | X | | X | No | | | PIDController_SetFeedForward_OBSOLETE_DELETE.vi | | Advanced PID, Obsolete – DELETE | | | |
| | X | | X | | | | PIDController_SetFFGain_OBSOLETE_DELETE.vi | | Advanced PID, Obsolete – DELETE | | | |
| | Χ | Χ | | Χ | SI | | PIDController_Setl.vi | | | | | |
| | | | | | | | PIDController_SetInputRange.vi | | OBSOLETE – Removed | | | |

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

| X | Χ | | X | SI | PIDController_SetIntegratorRange.vi | | | |
|---|---|---|---|----|-------------------------------------|--------------|--|--|
| Χ | Χ | X | X | SI | PIDController_SetOutputLimits.vi | Advanced PID | | |
| Χ | Χ | | X | SI | PIDController_SetP.vi | | | |
| Χ | Χ | X | Χ | 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 | Χ | | X | SI | PIDController_SetTolerance.vi | | | |
| Χ | Χ | | X | SI | PIDController_SetTolerancePandV.vi | | | |

| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
|-------------------------|-------------|------------|------------|-----------|---------------------|--------------|----------------|---|--------------------|-------------------------------------|-------------|--------------|----------------|
| PROFILED PID CONTROLLER | X | Χ | | X | SI | | | ProfiledPIDController_AtGoal.vi | | | | | |
| | X | Χ | | X | SI | | | ProfiledPIDController_AtSetpoint.vi | | | | | |
| | X | Χ | | X | | | | ProfiledPIDController_Calculate_Meas_Goal.vi | | | | | |
| | X | Χ | | X | | | | ProfiledPIDController_Calculate_Meas_StateGoal_TrapCnsrt.vi | | | | | |
| | X | Χ | | X | | | | ProfiledPIDController_Calculate_Meas_StateGoal.vi | | | | | |
| | Χ | Χ | | X | | | | ProfiledPIDController_Calculate_Meas.vi | | | | | |
| | Χ | Χ | | X | SI | | | ProfiledPIDController_DisableContInput.vi | | | | | |
| | Χ | Χ | | X | SI | | | ProfiledPIDController_EnableContInput.vi | | | | | |
| | Χ | X | X | X | 1 | | | ProfiledPIDController_Execute.vi | | Single call LabVIEW style function. | | | |
| | X | Χ | | X | SI | | | ProfiledPIDController_GetGoal.vi | | | | | |
| | X | Χ | | X | SI | | | ProfiledPIDController_GetPeriod.vi | | | | | |
| | X | Χ | Χ | X | SI | | | ProfiledPIDController_GetPID.vi | | WPILIB has separate getters. | | | |
| | X | Χ | | X | SI | | | ProfiledPIDController_GetPositionError.vi | | | | | |
| | X | Χ | | X | SI | | | ProfiledPIDController_GetSetpoint.vi | | | | | |
| | X | Χ | | X | SI | | | ProfiledPIDController_GetVelocityError.vi | | | | | |
| | X | Χ | | X | 1 | | | ProfiledPIDController_New.vi | | | | | |
| | Χ | Χ | | X | 1 | | | ProfiledPIDController_NewPeriod.vi | | | | | |
| | Χ | Χ | | X | SI | | | ProfiledPIDController_Reset_PosOnly.vi | | | | | |
| | X | | | X | SI | | | ProfiledPIDController_Reset_PosVel.vi | | | | | |
| | Χ | Χ | | X | SI | | | ProfiledPIDController_Reset.vi | | | | | |
| | X | Χ | | X | SI | | | ProfiledPIDController_SetConstraints.vi | | | | | |
| | Χ | Χ | | X | SI | | | ProfiledPIDController_SetGoal_PosOnly.vi | | | | | |
| | Χ | Χ | | X | SI | | | ProfiledPIDController_SetGoal.vi | | | | | |
| | Χ | Χ | | X | SI | | | ProfiledPIDController_SetIntegratorRange.vi | | | | | |
| | Χ | Χ | | X | SI | | | ProfiledPIDController_SetPID.vi | | | | | |
| | Χ | Χ | | X | SI | | _ | ProfiledPIDController_SetTolerance_PosOnly.vi | | | | | |
| | X | X | | X | SI | | | ProfiledPIDController_SetTolerance_PosVel.vi | | | | | |
| | | | | | | | | | | | | | |

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

Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. Ramsete SINC.vi $X \mid X$ sinc internal Execution Optin Not WPILIB Function Prototype Notes SIMPLE MOTOR FEEDFORWARD X X Χ SI SimpleMotorFF Calculate CalcAccel.vi Χ Χ Χ SimpleMotorFF Calculate NextV Dt.vi XX X SI SimpleMotorFF Calculate.vi public double calculate(double velocity, double acceleration) XX X SI SimpleMotorFF_CalculateVelocityOnly.vi public double calculate(double velocity) SimpleMotorFF_MaxAchieveAccel.vi X Χ X public double maxAchievableAcceleration(double maxVoltage, double velocity) XX Χ SimpleMotorFF MaxAchieveVel.vi public double maxAchievableVelocity(double maxVoltage, double acceleration) X Χ SimpleMotorFF MinAchieveAccel.vi public double minAchievableAcceleration(double maxVoltage, X double velocity) SimpleMotorFF_MinAchieveVel.vi Χ X Χ public double minAchievableVelocity(double maxVoltage, double X X X SI SimpleMotorFF New.vi public SimpleMotorFeedforward(double ks, double kv, double ka) public SimpleMotorFeedforward(double ks, double kv) '======= **GEOMETRY** VI Name Function Prototype Notes COORDINATE AXIS CoordAxis D.vi Χ Χ SI CoordAxis E.vi X X SI CoordAxis N.vi Χ X SI CoordAxis New.vi Χ X SI CoordAxis S.vi X X SI CoordAxis U.vi Χ X SI CoordAxis W.vi Function Prototype Notes COORDINATE SYSTEM CoordSystem_Convert_Pose3d.vi X Χ SI CoordSystem_Convert_Rotation3d.vi X X SI X CoordSystem_Convert_Translation3d.vi Χ SI Χ SI X CoordSystem_EDN.vi X Χ Χ SI X CoordSystem NED.vi Χ Χ SI X CoordSystem New.vi X SI X CoordSystem_NWU.vi ltem Function Prototype Notes Χ POSE2D X X SI Pose2d Equals.VI boolean equals(other obj) XX XX Pose2d Exp.vi pose2d exp(twist2d twist)

| Implementation L | _ist | | | | | | | | | | | | |
|----------------------|---------------------------------|------------|------------|----------------------------|----------------------------------|--------------|----------------|---|--|-----------------------------|-------------|--------------|----------------|
| el follower and time | | | e routi | | | | | | | | | | |
| | X | X | | X | SI | | | Pose2d_getRotation.vi | rotation2d getRotation() | can also use cluster unpack | | | |
| | X | Χ | | Χ | SI | | | Pose2d_getTranslation.vi | translation2d getTranslation() | can also use cluster unpack | | | |
| | X | Χ | Χ | Χ | SI | | | Pose2d_getXY.vi | | | | | |
| | X | Χ | Χ | Χ | SI | | | Pose2d_getXYAngle.vi | | | | | |
| | | Χ | | Χ | 1 | | | Pose2d_Interpolate.vi | | | | | |
| | | X | | X | X | | | Pose2d_Log.vi | twist2d log(pose2d end) | | | | |
| | | Χ | | X | SI | | | Pose2d_Minus.vi | transform2d minus(pose2d other) | | | | |
| | | X | | Χ | SI | | | Pose2d_New_TRRO.vi | pose2d new(translation2d, rotation2d) | | | | |
| | | X | | X | SI | | | Pose2d_New.vi | pose2d new(double x, double y, rotation2d) | | | | |
| | X | X | | Χ | SI | | | Pose2d_Plus.vi | pose2d plus(transform2d other) | | | | |
| | | X | | Χ | SI | | | Pose2d_RelativeTo.vi | pose2d relativeto(pose2d other) | | | | |
| | X | Χ | | Χ | SI | | | Pose2d_TransformBy.vi | pose2d transformby(transform2d other) | | | | |
| | | | | | | | | | pose2d new() | can use cluster constant | | | |
| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| POSE3D | X | | | X | SI | İ | | Pose3d_Equals.VI | 71 | | | , | |
| | X | | | Χ | Χ | | | Pose3d_Exp.vi | | | | | |
| | X | | | Χ | SI | | | Pose3d_getRotation.vi | | | | | |
| | X | | | X | SI | | | Pose3d_getTranslation.vi | | | | | |
| | X | | Χ | X | SI | | | Pose3d_getXYZ.vi | | | | | |
| | X | | | X | 1 | | | Pose3d_Interpolate.vi | | | | | |
| | X | | | X | X | | | Pose3d_Log.vi | | | | | |
| - | X | | | X | SI | | | Pose3d Minus.vi | | | | | |
| - | X | | | X | SI | | | Pose3d New.vi | | | | | |
| - | X | | | X | SI | | | Pose3d New Default.vi | | | | | |
| - | X | | | X | SI | | | Pose3d New Trans3dRot3d.vi | | | | | |
| - | X | | | X | SI | | | Pose3d Plus.vi | | | | | |
| - | X | | | X | SI | | | Pose3d RelativeTo.vi | | | | | |
| _ | X | | | X | SI | | | Pose3d RotationVectorToMatrix.vi | | | | | |
| _ | X | | | X | SI | | | Pose3d ToPose2d.vi | | | | | |
| - | X | | | X | SI | | | Pose3d_TransformBy.vi | | | | | |
| - | ^ | | | | 31 | | | 1 03e3u_Transionniby.vi | | | | | |
| QUATERNION | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| QUATERNION | X | | | X | SI | | | Quaternion_Equals.vi | | | | | |
| | X | | | X | SI | | | Quaternion_Get_All.vi | | | | | |
| ŀ | X | | | X | SI | | | Quaternion_Get_LVQuat.vi | | | | | |
| | | | | х | | | | Quaternion_Get_Vect.vi | | | | | |
| ľ | X | | | | SI | | | | | | | | |
| | X X | | | Χ | SI | | | Quaternion_Get_W.vi | | | | | |
| | X X X | | | X | SI SI | | | Quaternion_Inverse.vi | | | | | |
| | X X X | | | X X X | SI SI SI | | | Quaternion_Inverse.vi Quaternion_New.vi | | | | | |
| | X X X X | | | X X X | SI SI SI | | | Quaternion_Inverse.vi Quaternion_New.vi Quaternion_New_Default.vi | | | | | |
| | X X X X X | | | X X X X | SI SI SI SI | | | Quaternion_Inverse.vi Quaternion_New.vi Quaternion_New_Default.vi Quaternion_New_LVQuat.vi | | | | | |
| | X X X X X X | | | X X X X X | SI SI SI SI SI | | | Quaternion_Inverse.vi Quaternion_New.vi Quaternion_New_Default.vi Quaternion_New_LVQuat.vi Quaternion_Normalize.vi | | | | | |
| | X X X X X X X | | | X X X X X X | SI SI SI SI SI SI | | | Quaternion_Inverse.vi Quaternion_New.vi Quaternion_New_Default.vi Quaternion_New_LVQuat.vi Quaternion_Normalize.vi Quaternion_Plus.vi | | | | | |
| | X X X X X X | | | X X X X X | SI SI SI SI SI | | | Quaternion_Inverse.vi Quaternion_New.vi Quaternion_New_Default.vi Quaternion_New_LVQuat.vi Quaternion_Normalize.vi | | | | | |

FRC_LabVIEW_Trajectory_Library_Routines.xlsx Page 8 / 36 FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. Function Prototype ROTATION2D XX Rotation2d CreateAngle.vi rotation2d new(double value) X SI Rotation2d_CreateAngleDegrees.vi Χ Χ X SI rotation2d fromDegrees(double degrees) convert to radians then create Χ Rotation2d CreateAngleRotations.vi X X SI X X X SI Rotation2d CreateXY.vi rotation2d new(double x, double y) boolean equals(rotation2d other) XX X SI Rotation2d Equals.vi X X X X SI Rotation2d GetAngleCosSin.vi New 1/26/21 Χ X SI Rotation2d GetCos.VI double getCos() X use cluster unpack SI Rotation2d GetDegrees.VI double getDegrees() use cluster unpack, then convert to degree X X X SI Rotation2d GetRadians.VI double getRadians() use cluster unpack Rotation2d GetRotations.vi XX X SI X SI Rotation2d GetSin.VI $X \mid X$ double getSin() use cluster unpack XX X SI Rotation2d GetTan.VI double getTan() can calculate XX X SI Rotation2d Interpolate.vi Χ X SI Rotation2d Minus.vi X rotation2d minus(rotation2d other) Χ X SI Rotation2d Plus.vi rotation2d plus(rotation2d other) X X X SI Rotation2d RotateBy.vi rotation2d rotateby(rotation2d other) X X SI Rotation2d Times.vi rotation2d times(double scalar) Χ XX X SI Rotation2d UnaryMinus.vi rotation2d unaryminus() rotation2d new() can use cluster constant **Function Prototype** Notes ROTATION3D Χ X SI Rotation3d Create AxisAngle.vi Rotation3d_Create_Default.vi SI Χ X Χ X SI Rotation3d Create Quaternion.vi Χ Rotation3d Create RollPitchYaw.vi Χ SI X X SI Rotation3d Equals.vi Χ X Rotation3d GetAxisAngle.vi Rotation3d_GetQuaternion.vi X X SI Χ X SI Rotation3d GetXYZ.vi Rotation3d_Interpolate.vi Χ X SI X X SI Rotation3d Minus.vi Rotation3d Plus.vi Χ X SI X Rotation3d RotateBy.vi X SI Rotation3d Times.vi Χ X SI Χ Χ Rotation3d_ToRotation2d.vi X X SI Rotation3d UnaryMinus.vi Function Prototype Notes TRANSFORM2D X X Transform2d Create PosePose.vi X SI transform2d new(pose2d, pose2d) X SI Transform2d Create TransRot.vi transform2d new(translation2d, rotation2d) Χ X SI Χ Transform2d Equals.VI boolean equals(other transform2d) Χ X SI Transform2d GetRotation.VI X rotation2d getRotation() use cluster unpack

translation2d getTranslation()

use cluster unpack

XX

X X X X SI

X X X X SI

X SI

Transform2d GetTranslation.VI

Transform2d_GetXYAngle.vi

Transform2d GetXY.vi

FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time interpretations of the interpretation of the control
| nodel follower and time | interno | nlatahl | e routir | 166 | | | | | _ | | | | |
|---|---|------------|--------------|---------------------------------------|---|--------------|--|--|---|---|-------------|--------------|----------------|
| odel follower and time interpolatable routines. | | | | | | | | Transform2d Inverse.vi | transform inverse() | new | | | |
| | X | X | | X | Si | | | Transform2d Plus.vi | transionin inverse() | liew | | | |
| | X | X | | X | 01 | | | Transform2d Times.vi | transform2d times(double scalar) | | | | |
| | ^ | ^ | | ^ | SI | | | Transiornizu_times.vi | | can use cluster constant | | | |
| | | | | | | | | | transform2d new() | can use cluster constant | | | |
| TRANSFORM3D | X X X X X X X X X X X X X X X X X X X | Documented | X Not WPILIB | X X X X X X X X X X X X X X X X X X X | Image: Control of the control of t | Test Routine | | VI Name Transform3d_Create_Default.vi Transform3d_Create_Pose3dPose.3dvi Transform3d_Create_Trans3dRot3d.vi Transform3d_Equals.VI Transform3d_GetRotation3d.VI Transform3d_GetTranslation3d.VI Transform3d_GetXYZ.vi Transform3d_Inverse.vi Transform3d_Plus.vi Transform3d_Times.vi | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| | | | | | | | | | | | | | |
| TRANSLATION2D | X X X X X X X X X | X | | X X X X X | SI SI | Test Routine | | VI Name Translation2d_Create_DistAng.vi Translation2d_Create.vi Translation2d_Equals.vi Translation2d_GetAngle.vi Translation2d_GetDistance.vi Translation2d_GetNorm.VI Translation2d_GetX.VI Translation2d_GetX.VI Translation2d_GetY.VI Translation2d_GetY.VI Translation2d_Interpolate.vi Translation2d_Minus.vi Translation2d_Plus.vi Translation2d_RotateBy.vi Translation2d_Times.vi Translation2d_UnaryMinus.vi | Function Prototype translation2d new(double x, double y) boolean equals(translation other) double getDistance(translation2d other) double getNorm() double getX() translation2d minus(translation2d other) translation2d plus(translation2d other) translation2d rotateBy(rotation2d other) translation2d times(double scalar) translation2d unaryminus() | Notes can use cluster unpack can use cluster unpack can use cluster unpack | Code Review | Test Program | Error Checking |
| | | | | | | | | | translation2d new() | can use cluster constant | | | |
| TRANSLATION3D | X X X X X X X X X X X X X X X X X X X | Documented | Not WPILIB | X X X X X X | ପ୍ର ପ୍ର ପ୍ର ପ୍ର ପ୍ର ପ୍ର ପ୍ର ପ୍ର Execution Optimized | Test Routine | | VI Name Translation3d Create.vi Translation3d Create Default.vi Translation3d Create DistAng.vi Translation3d Div.vi Translation3d Equals.vi Translation3d GetDistance.vi Translation3d GetNorm.VI Translation3d GetXYZ.vi Translation3d Interpolate.vi Translation3d Minus.vi | Function Prototype | Notes | Code Review | Test Program | Error Checking |

| 1100131011 2.70 3/2/2022 — added 111 | · | X | | | SI | | Translation3d_Plus.vi | | | | | |
|--------------------------------------|-------------------------|-------------|---|---------------------|-------------------|---------------------------------|--|--|--|-------------|--------------|------------------|
| | | Χ | | X | SI | | Translation3d_RotateBy.vi | | | | | |
| | | X | | X | SI | | Translation3d_Times.vi | | | | | |
| | | X X | | $\frac{X}{X}$ | SI | | Translation3d_ToTranslation2d.vi | | | | | |
| | L | X | | X | SI | | Translation3d_UnaryMinus.vi | | | | | |
| | TWIST2D | X X | X | X X Wenu Item | SI SI | Test Routine Sample Program | VI Name Twist2d_Create.vi Twist2d_Equals.VI Twist2d_GetAll.VI | Function Prototype twist new(x, y, theta) boolean equals(obj other) | Notes | Code Review | Test Program | Error Checking |
| | | ^ / | <u>\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ </u> | | 31 | | I WISIZU_GEMII.VI | | | | | |
| | TWIST3D | _ | Documented Not WPILIB | X Menu Item | Ехес | X Test Routine Sample Program | VI Name Twist3d_Create.vi | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| | IWISISD | X | | X | SI | X | Twist3d_Create.vi | | | | | |
| | | X | X | $\frac{\lambda}{X}$ | SI | X | Twist3d GetAll.VI | | | | | |
| '===== KINEMATICS '======== | | | | | <i>p</i> e: | | | | | | | |
| | | Implemented | Documented Not WPILIB | Menu Item | Execution Optimiz | Test Routine Sample Program | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| | CHASSIS SPEEDS | | X | X | SI | | ChassisSpeeds_FromFieldRelativeSpeeds.VI | chassisspeeds fromFieldRelativeSpeeds(double x, double y, | | | , | |
| | | | | | | | | double angvel, rotation2d robotangle) | | | | |
| | | | | (X | | | ChassisSPeeds_GetXYOmega.vi | | | | | |
| | | X) | X | X | SI | | ChassisSpeeds_New.vi | chassisspeeds new (double xvel, double yvel, double angvel) chassisspeeds new () | can use cluster constant | | | |
| DIFFERI | ENTIAL DRIVE KINEMATICS | 5 0 | X X Documented Not WPILIB | X Wenu Item | I Exec | X X Test Routine Sample Program | VI Name DiffKinematics_New.vi DiffKinematics_toChassisSpeed.vi DiffKinematics_toWheelSpeed.vi | Function Prototype diffDriveKine new(double trackWidth) chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds) diffDriveWheelSpeed toWheelSpeeds(chassisSpeeds) | Notes | Code Review | Test Program | 3 Error Checking |
| DIFFER | EENTIAL DRIVE ODOMETRY | | X Not WPILIB | Men | Exec | Test Routine Sample Progra | VI Name DiffOdometry_Execute.vi DiffOdometry_Update.vi | Function Prototype pose2d update(rotation2d gyro, double leftdist, double right dist) diffDrOdom new(rotation gyro, pose initial) | Notes DONT NEED Incorporates enhanced reset | 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 | interpo | latable | routin | es. | | | | diffDrOdom new(rotation gyro) | | | | |
| | | | | | | | | void resetPosition(pose2d, rotation2d) | incorporated into "update" | | | |
| | | | | | | | | pose2d getPoseMeters() | | | | |
| | ənted | ented | ILIB | em on Optimized | Test Routine | Program | | | | eview | ogram | hecking |
| | тріетеп | Documente | Not WPILIE | Menu Iter Execution | t Ro | Sample | | | | Ť Ā | t Pro | r C |
| | lmp | Оос | Not | Mer Exe | Tes | San | VI Name | Function Prototype | Notes | CO | Tes | Errc |
| DIFFERENTIAL DRIVE WHEEL SPEEDS | 3 | | | | | | | diffDrWheelSpeeds new() | | | | |
| | X | X | | XX | | | DiffWheel Normalize.vi | diffDrWheelSpeeds new(double leftVel, double rightVel) void normalize(double maxVel) | | | | |
| | | ,, | | X X | | | SHIVITOON_TOTALIZED.TT | void normalize(double maxvor) | | | | |
| MECANUM DRIVE KINEMATIC | Implemented | Doc | Not WPILIB | Menu Item Execution Optimized | Test Routine | | VI Name MecaKinematics New.vi | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| MECANUM DRIVE KINEMATICS | | X | | X | | | MecaKinematics_New.vi MecaKinematics_SetInverseKinematics.vi | | | | | |
| | X | X | | XX | | | MecaKinematics_ToChassisSpeeds.vi | | | | | |
| | X | X | | XX | | | MecaKinematics_ToWheelSpeeds.vi | | | | | |
| | X | X | | XX | | | MecaKinematics_ToWheelSpeedsZeroCenter.vi | | | | | |
| MECANUM DRIVE MOTOR VOLTAGI | Implemented | Documented | Not WPILIB | Menu Item Execution Optimize | Test Routine | Sample Program | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| | thing do | ne | | | | | | 1 | | | | |
| | Implemented | Doc | Not WPILIB | Menu Item Execution Optimized | Test Routine | | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| MECANUM DRIVE ODOMETRY | | | X | X | | | MecaOdometry_Execute.vi MecaOdometry GetKinematics.vi | | | | | |
| | X | X | | X | | | MecaOdometry_GetRinematics.vi MecaOdometry_GetPose.vi | | | | | |
| | X | X | | X | | | MecaOdometry_New.vi | | | | | |
| | X | X X | | X X | | | MecaOdometry_NewDefaultPose.vi MecaOdometry_Reset.VI | | | | | |
| | X | X | | X | | | MecaOdometry_Update.vi | | | | | |
| | | Χ | | X | | | MecaOdometry_UpdateWithTime.vi | | | | | |
| | Implemented | Documented | Not WPILIB | Menu Item Execution Optimized | Test Routine | Sample Program | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| MECANUM DRIVE WHEEL SPEEDS | | X | V | X SI | | | MecaWheel_New.Vi MecaWheel GetAll.vi | public MecanumDriveWheelSpeeds(double frontLeftMetersPerSecond, double frontRightMetersPerSecond, double rearLeftMetersPerSecond, double rearRightMetersPerSecond) | | | · | 7 |
| | ٨ | ^ | ^ | A SI | | | INICCAVVILLEI_GELAII.VI | 1 | | | | |

Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. MecaWheel Normalize.vi public void normalize(double attainableMaxSpeedMetersPerSecond) Optimized Routine WPILIB ltem Function Prototype VI Name Notes SWERVE DRIVE KINEMATICS X SwerveKinematics_New4.VI For 4 module drives X X X Χ SwerveKinematics NewX.VI uses array as input X X SwerveKinematics NormalizeWheelSpeeds.vi public static void normalizeWheelSpeeds(SwerveModuleState[] moduleStates, double attainableMaxSpeedMetersPerSecond) SwerveKinematics ToChassisSpeeds4.VI $X \mid X \mid X \mid X$ For 4 module drives $X \mid X \mid X \mid X$ SwerveKinematics_ToChassisSpeedsX.VI uses array as input X SwerveKinematics ToSwerveModuleStates.VI public SwerveModuleState[] X toSwerveModuleStates(ChassisSpeeds chassisSpeeds, Translation2d centerOfRotationMeters) SwerveKinematics_ToSwerveModuleStatesZeroCenter.VI X X Χ public SwerveModuleState[] toSwerveModuleStates(ChassisSpeeds chassisSpeeds) public SwerveDriveKinematics(Translation2d... wheelsMeters) variable parameters (replace with array and "4" calls) public ChassisSpeeds toChassisSpeeds(SwerveModuleState... variable parameters (replace with array and "4" calls) Menu Item **Function Prototype** Notes SWERVE DRIVE ODOMETRY SwerveOdometry Execute4.vi SwerveOdometry ExecuteX.vi X X SwerveOdometry GetPosition.VI public Pose2d getPoseMeters() X SwerveOdometry_New.VI public SwerveDriveOdometry(SwerveDriveKinematics kinematics, X Χ Rotation2d gyroAngle, Pose2d initialPose) XX X SwerveOdometry NewZeroCenter.VI public SwerveDriveOdometry(SwerveDriveKinematics kinematics, Rotation2d gyroAngle) public void resetPosition(Pose2d pose, Rotation2d gyroAngle) Χ Χ SwerveOdometry ResetPosition.VI X X X SwerveOdometry Update4.VI For 4 module drives X X X SwerveOdometry UpdateWithTime4.VI For 4 module drives X X X X SwerveOdometry_UpdateWithTimeX.VI uses array as input SwerveOdometry UpdateX.VI X X X X uses array as input public Pose2d updateWithTime(double currentTimeSeconds, variable parameters (replace with Rotation2d gyroAngle, SwerveModuleState... moduleStates) array and "4" calls) public Pose2d update(Rotation2d gyroAngle, variable parameters (replace with SwerveModuleState... moduleStates) array and "4" calls) Item Routin Function Prototype Notes SWERVE DRIVE MODULE STATE X X X SI SwerveModuleState CompareTo.vi public int compareTo(SwerveModuleState o) SI SwerveModuleState Get.vi X SI public SwerveModuleState(double speedMetersPerSecond, SwerveModuleState New.vi X Χ X Rotation2d angle) Χ Χ X SI SwerveModuleState Optimize.vi public SwerveModuleState optimize(SwerveModuleState desired, Rotation2d angle)

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

FRC_LabVIEW_Trajectory_Library_Routines.xlsx

| y Library – VI Implementation L | | alatab | lo rout | inaa | | | | | | | | | |
|--|---------------------|----------------|------------|---------------|---------------------|--------------|----------------|--|--|---|-------------|--------------|----------------|
| led implicit model follower and time i | nterp | olatab | ie rout | ines. | Ø | | | | | | | | |
| CUBIC HERMITE SPLINE | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimize | Test Routine | | VI Name | | Notes not needed, use cluster unpack | Code Review | Test Program | Error Checking |
| | X | X | | X | | | | CubicHermiteSpline_getControlVectorFromArrays.vi | private SimpleMatrix getControlVectorFromArrays(double[] | | | | |
| | | | | ~ | | | | Cubial larmita Culina makal larmita Basia vi | initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() | | | | |
| | X | X | | X | | | | CubicHermiteSpline_makeHermiteBasis.vi CubicHermiteSpline_New.vi | private SimpleMatrix makeHermiteBasis() public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector) | | | | |
| | mplemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | VI Name | Eunation Prototyna | Notes | Code Review | Test Program | Error Checking |
| POSE WITH CURVATURE | | X | _ < | _≥ X | SI | | | PoseWithCurve_New.vi | Function Prototype public PoseWithCurvature(Pose2d poseMeters, double | Notes | O | | Щ |
| POSE WITH CORVATORE | ^ | ^ | | ^ | 31 | | | Fosevviii Cui ve_inew.vi | curvatureRadPerMeter) | | | | |
| | | | | | | | | | public PoseWithCurvature() | can use cluster constant | | | |
| | | | | | | | | | | not needed, use cluster unpack | | | |
| | | | | | | | | | public double curvatureRadPerMeter | not needed, use cluster unpack | | | |
| QUINTIC HERMITE SPLINE | X X Implemented | X X Documented | Not WPILIB | X X Menu Item | Execution | Test Routine | | VI Name QuinticHermiteSpline_getControlVectorFromArrays.vi QuinticHermiteSpline_makeHermiteBasis.vi QuinticHermiteSpline_New.vi | private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public QuinticHermiteSpline(double[] xlinitialControlVector, double[] xFinalControlVector, double[] yFinalControlVector) | Notes not needed, use cluster unpack | Code Revi | Test Program | Error Checking |
| SPLINE (Abstract class) | X Implemented | X Documented | Not WPILIB | X Menu Item | Execution Optimized | Test Routine | | VI Name Spline_getPoint.vi | public PoseWithCurvature getPoint(double t) Spline(int degree) | Notes | Code Review | Test Program | Error Checking |
| | | | | | | | | | public static class ControlVector public ControlVector(double[] x, double[] y) | implemented as data structure | | | |
| L | | | | | | | | | Panic Control vector (acanie[] x, acanie[] y) | Implemented as data structure | | | |
| | mplemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | VI Name | Function Prototype | Notes | Code Review | Test Program | error Checking |
| SPLINE HELPER | _ = | X | _<_ | _ ∠ | SI | | | SplineHelp_GetCubicCtrlVector.vi | private static Spline.ControlVector getCubicControlVector(double | 11000 | <u> </u> | | Ш |
| OI LINE HELP'EN | X | X | | X | J, | X | | SplineHelp_GetCubicCtrlVectorsFromWayPts.vi | scalar, Pose2d point) public static Spline.ControlVector[] getCubicControlVectorsFromWaypoints(Pose2d start, | | | | |
| | | | | | | | | | Translation2d[] interiorWaypoints, Pose2d end) | | | | |

| nterpo | olatabl | e rout | tines. | | | | | |
|--------|---------|--------|--------|----|---|---|--|--------------|
| X | Χ | Χ | X | | | SplineHelp_GetCubicCtrlVectorsFromWeightedWayPts.vi | | |
| Χ | X | Χ | No | | | SplineHelp_GetCubicSpline_Calc1.vi | | internal |
| X | X | Χ | No | | | SplineHelp_GetCubicSpline_Calc2.vi | | internal |
| Χ | X | Χ | No | | | SplineHelp_GetCubicSpline_Calc3.vi | | internal |
| X | X | | X | | X | SplineHelp_getCubicSplinesFromControlVectors.vi | public static CubicHermiteSpline[] getCubicSplinesFromControlVectors(Spline.ControlVector start, Translation2d[] waypoints, Spline.ControlVector end) | |
| X | Χ | | X | SI | | SplineHelp_GetQuinticCtrlVector.vi | private static Spline.ControlVector getQuinticControlVector(double scalar, Pose2d point) | |
| | | | | | | SplineHelp_GetQuinticCtrlVectorsFromWayPts.vi | public static List <spline.controlvector> getQuinticControlVectorsFromWaypoints(List<pose2d> waypoints)</pose2d></spline.controlvector> | REMOVED 2762 |
| | | | | | | SplineHelp_GetQuinticCtrlVectorsFromWeightedWayPts.vi | | REMOVED 2762 |
| X | X | | X | | | SplineHelp_getQuinticSplinesFromControlVectors.vi | public static QuinticHermiteSpline[] getQuinticSplinesFromControlVectors(Spline.ControlVector[] controlVectors) | |
| Χ | X | Χ | X | | | SplineHelp_GetQuinticSplinesFromWeightedWayPts.vi | , | New 2762 |
| Χ | Χ | | X | | | SplineHelp_GetQuinticSplinesFromWayPts.vi | | New 2762 |
| X | Χ | | No | | | SplineHelp_ThomasAlgorithm.vi | private static void thomasAlgorithm(double[] a, double[] b, double[] c, double[] d, double[] solutionVector) | internal |

| SPLINE PARAMETERIZE | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program ample Program | Function Prototype | Notes | Code Review | Test Program | Error Checking |
|----------------------|-------------|------------|------------|-----------|---------------------|--------------|------------------------------|--|----------|-------------|--------------|----------------|
| SPLINE PARAMETERIZER | | X | | X | | | SplineParam_Spline_T0_T1.vi | public static List <posewithcurvature> parameterize(Spline spline, double t0, double t1)</posewithcurvature> | | | | |
| | X | X | | Х | | X | SplineParam_Spline.vi | public static List <posewithcurvature> parameterize(Spline spline)</posewithcurvature> | | | | |
| | Χ | Χ | Χ | No | | | SplineParam_StackGet.vi | | internal | | | |
| | Χ | Χ | Χ | No | | | SplineParam_StackPop.vi | | internal | | | |
| | Y | Y | Y | No | | | SplineParam StackPush vi | | internal | | | |

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

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

FRC_LabVIEW_Trajectory_Library_Routines.xlsx Page 15 / 36

| orary – VI Implementation L mplicit model follower and time i | | olatab | ole ro | utines | | | | | | _ | | | | |
|--|-------------|---------------------|------------|------------|---|---------------------|--------------|----------------|---|---|---|-------------|--------------|----------------|
| | 'mplemented | Documented | Not WPILIB | | | Execution Optimized | Test Routine | Sample Program | N/(N | Foresting Poststand | Mate | Code Review | Test Program | Error Checking |
| TRAJECTORY STATE | | X | _ ≥ | | | | <u> </u> | Ŋ | VI Name | Function Prototype | Notes | Ö | Ĕ | <u> </u> |
| TRAJECTORY_STATE | | X | X | X | | SI SI | - | | TrajectoryState_Equals.vi | boolean equals(other obj) | | | | |
| - | X | X | _^ | | | SI | - | | TrajectoryState_GetAll.vi TrajectoryState_GetPose.vi | | | | | |
| - | X | X | | $+\hat{x}$ | | OI | | | TrajectoryState_Interpolate.vi | State interpolate(State endValue, double i) | | | | |
| | X | \overline{X} | | $+\hat{x}$ | | SI | | | TrajectoryState_New.vi | public State(double timeSeconds, double | | | | |
| | | | | | | | | | | velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State() | | | | |
| | | | | | | ď | | | | public State() | | | | |
| | mplemented | Documented | Not WPILIB | Menultem | | Execution Optimized | Test Routine | Sample Program | | | | Code Review | Test Program | Error Checking |
| _ | _ | | ຸ ≥ | | | | | Sa | VI Name | Function Prototype | Notes | ပိ | 7e | <u>_</u> |
| TRAJECTORY CONFIG | X | X | X | X | (| SI | | | TrajectoryConfig_Create.vi TrajectoryConfig_setCentripetalAccel.vi | public TrajectoryConfig(double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq) | | | | |
| - | \hat{X} | $\frac{\lambda}{X}$ | _^ | $+\hat{x}$ | | SI | | | TrajectoryConfig_setCentripetalAccer.vi TrajectoryConfig_setKinematicsDiffDrive.vi | public TrajectoryConfig setKinematics(DifferentialDriveKinematics | | | | |
| | | | | | | | | | | kinematics) | | | | |
| - | X | X | | | | SI | | | TrajectoryConfig_setKinematicsMecanumfDrive.vi | public TrajectoryConfig setKinematics(MecanumDriveKinematics kinematics) | | | | |
| | X | X | | ^ | (| SI | | | TrajectoryConfig_setKinematicsSwerveDrive.vi | public TrajectoryConfig setKinematics(SwerveDriveKinematics kinematics) | | | | |
| | X | X | | X | | SI | | | TrajectoryConfig_setReversed.vi | public TrajectoryConfig setReversed(boolean reversed) | | | | |
| | Χ | Χ | X | X | | SI | | | TrajectoryConfig_setVoltageDiffDrive.vi | | | | | |
| | | | | | | | | | | public TrajectoryConfig addConstraint(TrajectoryConstraint constraint) | Implemented differently, can't duplicate. | | | |
| | | | | | | | | | | public TrajectoryConfig addConstraints(List extends TrajectoryConstraint constraints) | Implemented differently, can't duplicate. | | | 1 |
| | | | | | | | | | | public double getStartVelocity() | can use cluster unpack | | | |
| | | | | | | | | | | public TrajectoryConfig setStartVelocity(double | can use cluster unpack | | | |
| | | | | | | | | | | startVelocityMetersPerSecond) | | | | |
| | | | | | | | | | | public double getEndVelocity() | can use cluster unpack | | | |
| | | | | | | | | | | public TrajectoryConfig setEndVelocity(double | | | | 1 |
| | | | | - | + | -+ | - | | | endVelocityMetersPerSecond) | con uso duster upped | | | |
| | | | + | + | + | -+ | -+ | | | public double getMaxVelocity() public double getMaxAcceleration() | can use cluster unpack can use cluster unpack | | | |
| | | | | | | | | | | public List <trajectoryconstraint> getConstraints()</trajectoryconstraint> | Implemented differently, can't | | | |
| | | | | | | | | | | , , , , , , , , , , , , , , , , , , , | duplicate. | | | |
| | | | | | | | | | | public boolean isReversed() | can use cluster unpack | | | |
| | | | | | | | | | | NOTE ADD OTHER "SET" ROUTINES FOR OTHER CONTRAINTS HERE, SINCE NEW CONTRAINTS ARE SPECIFIC AND NOT GENERIC. | | | | |
| | mplemented | Documented | Vot WPILIB | Menu Item | | Execution Optimized | Test Routine | Sample Program | | | | Code Review | Test Program | i |
| TDA IEOTODY OFNED : TT | _=_ | | _ ž | | | Ú, | <u> </u> | ιχ | VI Name | Function Prototype | Notes | Ū | Ĕ | <u> </u> |
| TRAJECTORY GENERATE | | X | | X | | | | | TrajectoryGenerate_Make_Cubic_CtrlVect.vi | public static Trajectory generateTrajectory(Spline.ControlVector initial, List <translation2d> interiorWaypoints, Spline.ControlVector end, TrajectoryConfig config)</translation2d> | | | | |
| | X | X | | X | | | | | TrajectoryGenerate_Make_Cubic.vi | public static Trajectory generateTrajectory(Pose2d start, List <translation2d> interiorWaypoints, Pose2d end, TrajectoryConfig config)</translation2d> | uses cubic splines | | | |
| | Χ | Χ | X | X | | | | | TrajectoryGenerate_Make_Generic.vi | Helper to bring these all together | Use this one!!! | | | |

| FRC LabVIEW Trajectory Library – VI Implementation L | ist | | | | | | | | | | | |
|--|----------------|--------------|------------|--|--------------|----------------|---|--|---|-------------|--------------|----------------|
| Revision 2.X 5/2/2022 – added implicit model follower and time i | | | | | | _ | Turington Company Marks Ovintin Otall (anti- | with the state Tuning term, were such Tuning term, (On when IV a stand into | | | | |
| | X | X | | X | | | TrajectoryGenerate_Make_Quintic_CtrlVect.vi | public static Trajectory generateTrajectory(ControlVectorList controlVectors, TrajectoryConfig config) | uses quintic splines | | | |
| | Χ | Χ | Χ | X | | | TrajectoryGenerate_Make_Quintic_Weighted.vi | | New 2762 | | | |
| | X | X | | X | | | TrajectoryGenerate_Make_Quintic.vi TrajectoryGenerate_splinePointsFromSplines.vi | public static Trajectory generateTrajectory(List <pose2d> waypoints, TrajectoryConfig config) public static List<posewithcurvature> splinePointsFromSplines(Spline[] splines)</posewithcurvature></pose2d> | uses quintic splines | | | |
| TRAJECTORY GENERATE (Control Vector) | Implemented | Documented | Not WPILIB | Menu Item Execution Ontimized | | Sample Program | VI Name | Function Prototype public ControlVectorList(int initialCapacity) public ControlVectorList() | Notes may not need, just data may not need, just data | Code Review | Test Program | Error Checking |
| | | | | | | | | public ControlVectorList(Collection extends</td <td>may not need, just data</td> <td></td> <td></td> <td></td> | may not need, just data | | | |
| | Implemented | Documented | | : Menu Item Execution Ontimized | | Sample Program | VI Name | Spline.ControlVector> collection) Function Prototype | Notes | Code Review | Test Program | Error Checking |
| TRAJECTORY PARAMETERIZE | | X | | No No | | | TrajectoryParam_calcStuffFwd.vi 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. | | | |
| | X | X | X | No | | | TrajectoryParam_enforceVelocity.vi | | This routines needs to be changed when new constraints are added. | | | |
| | X | X | | X | | | TrajectoryParam_timeParam.vi | public static Trajectory timeParameterizeTrajectory(List <posewithcurvature> points. List<trajectoryconstraint> constraints, double startVelocityMetersPerSecond, double endVelocityMetersPerSecond, double maxVelocityMetersPerSecond, double maxAccelerationMetersPerSecondSq, boolean reversed)</trajectoryconstraint></posewithcurvature> | when new constraints are added. | | | |
| TRAJECTORY PARAMETERIZE CONSTRAINED STATE | X Implemented | X Documented | Not IA | X Menu Item | e de | Sample Program | VI Name ConstrainedState_New.vi | Function Prototype ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double | Notes | Code Review | Test Program | Error Checking |
| | | | | | | | | maxAccelerationMetersPerSecondSq) | | | | |
| | X | X | X | X X | | | ConstrainedState_SetMaxAccel.vi ConstrainedState_SetMinAccel.vi ConstrainedState_SetVelAccel.vi | | | | | |
| | | | Χ | | | | ConstrainedState_SetVelocity.vi | | | | | |
| l | | | | | | | | ConstrainedState() | | | | |
| TDA IFOTODY UTU [| < Implemented | Documented | Not W | Menu Item | Test Routine | Sample Program | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| TRAJECTORY UTIL | | X | | $\begin{array}{c c} X & \\ \hline X & \lambda \end{array}$ | | + | TrajectoryUtil_fromPathWeaverJSON.vi TrajectoryUtil_MakeWeightedWayPoint_ENG.vi | public static Trajectory fromPathweaverJson(Path path) | | | | |
| | X | X | X | <i>x x</i> | (| | TrajectoryUtil_MakeWeightedWayPoint.vi | | | | | |

| Revision 2.X 5/2/2022 – added implicit model follower and time | | 1 | ole rou | | | | | |
|--|---------------------------------|---------------------------------|------------|-----------------|-----------------------|--------------|--|---|
| | X | X | | X | | | TrajectoryUtil_toPathWeaverJSON.vi public static void toPathweaverJson(Trajectory trajectory, Path | |
| | | | | | | | path) | |
| | | _ | | | | | public static Trajectory deserializeTrajectory(String json) | |
| | | | | | | | public static String serializeTrajectory(Trajectory trajectory) | |
| TRAPEZOID PROFILE | X X X X X X X | X X X X X X X | Not WPILIB | X X No X X X No | छ Execution Optimized | Test Routine | VI Name Function Prototype TrapProfConstraint_New.vi TrapProfile_Calculate.vi TrapProfile_Direct.vi TrapProfile_Execute.vi TrapProfile_Execute.vi TrapProfile_Execute_AtGoal.vi TrapProfile_IsFinished.vi TrapProfile_New_DefInitial.vi TrapProfile_New.vi TrapProfile_New.vi TrapProfile_ShouldFlipAcceleration.vi | Notes Private, remove from menu Private, remove from menu |
| | X | | | X | | | TrapProfile_TimeLeftUntil.vi | |
| | X | Χ | | X | | | TrapProfile_TotalTime.vi | |
| | X | | | X | | | TrapProfState Equals.vi | |
| | X | | | X | | | TrapProfState New.vi | |
| CENTRIPETAL ACCELERATION CONSTRAINT | X Implemented | X Documented | Not WPILIB | X Menu Item | Execution Optimized | Test Routine | VI Name Function Prototype | Notes |
| | | | | | | | double curvatureRadPerMeter, double velocityMetersPerSecond) | |
| | X | X | | X | SI | | CentripetalAccelConstraint_New.vi public CentripetalAccelerationConstraint(double maxCentripetalAccelerationMetersPerSecondSq) | Can use cluster pack for now |
| DIFF DRIVE KINEMATIC CONSTRAINT | X Implemented | X Documented | Not WPILIB | X Menu Item | Execution Optimized | Test Routine | VI Name Function Prototype DiffDriveKinematicsConstraint_getMaxVelocity.vi public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double | Notes |
| | | | | | | | poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) | |
| | X | X | | X | | | DiffDriveKinematicsConstraint_getMinMaxAccel.vi public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) | |
| | X | X | | X | SI | | DiffDriveKinematicsConstraint_New.vi public DifferentialDriveKinematicsConstraint(final DifferentialDriveKinematics kinematics, double maxSpeedMetersPerSecond) | |

FRC_LabVIEW_Trajectory_Library_Routines.xlsx

| .X 5/2/2022 – added implicit model follower and time i | пстр | Olatabl | e rout | | pe | | | | |
|--|---------------------|----------------|------------|---------------|---------------------|--------------|--|--|-----------------------------|
| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Nample Program | Function Prototype | Notes |
| DIFF DRIVE VOLTAGE CONSTRAINT | _ | X | _ Z_ | X | Ш | <u> </u> | DiffDriveVoltageConstraint_getMaxVelocity.vi | public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) | Notes |
| | X | X | | X | | | DiffDriveVoltageConstraint_getMinMaxAccel.vi | public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) | |
| | X | X | | X | SI | | DiffDriveVoltageConstraint_New.vi | public DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage) | |
| | | | | | imized | | au B | | |
| | Implemented | Documented | Not WPILIB | Menu Item | Execution Opt | Test Routine | Sample Program Program | Function Prototype | Notes |
| JERK CONSTRAINT | / | | X | | | | JerkConstraint_getMaxVelocity.vi | Routine exists, it is just a shell | FUTURE |
| | / | | Χ | | | | JerkConstraint_getMinMaxAccel.vi | Routine exists, it is just a shell | FUTURE |
| | / | | Χ | | SI | | JerkConstraint_New.vi | Routine exists, it is just a shell | FUTURE |
| MECANUM DRIVE KINEMATICS CONSTRAINT | X X Implemented | X X Documented | Not WPILIB | X X Menu Item | Execution Optimiz | Test Routine | VI Name MecaDriveKinematicsConstraint_getMaxVelocity.vi MecaDriveKinematicsConstraint_getMinMaxAccel.vi | Function Prototype | Notes |
| | X | X | | X | SI | | MecaDriveKinematicsConstraint_New.vi | | |
| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | st Ro | Nampe Program | Function Prototype | Notes |
| SWERVE DRIVE KINEMATICS CONSTRAINT | Χ | X | | X | | | SwerveDriveKinematicsConstraint_getMaxVelocity.vi | public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) | |
| | X | X | | X | | | SwerveDriveKinematicsConstraint_getMinMaxAccel.vi | public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) | |
| | X | X | | X | SI | | SwerveDriveKinematicsConstraint_New.vi | Newpublic SwerveDriveKinematicsConstraint(final SwerveDriveKinematics kinematics, double maxSpeedMetersPerSecond) | Can use cluster pack for no |

TRAJECTORY CONSTRAINT

Interface class - nothing done (not needed)

FRC_LabVIEW_Trajectory_Library_Routines.xlsx Page 19 / 36 FRC LabVIEW Trajectory Library – VI Implementation List
Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines.

| /2022 – added implicit model follower and time | interpo | วเลเลง | ie rout | ines. | | | | | |
|--|-------------|------------|------------|-----------|---------------------|--------------|--------------------------------|-----------------------|-------|
| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | Function Prototype | Notes |
| TRAJECTORY CONSTRAINT (Min Max) | X | X | | X | SI | | Constraint_MinMax_New.vi | Constraint_MinMax_New | |
| | X | X | | X | SI | | Constraint MinMax NewMinMax.VI | Constraint MinMax New | |

'=======

UTILITY

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

JAVA / C++ WPILIB EQUIVALENT

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

'========= CONVERSIONS

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

| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | VI Name | Function Prototype | Notes |
|------|-------------|------------|------------|-----------|---------------------|--------------|----------------|------------------------------|--------------------|-------|
| CONV | X | X | X | X | SI | | | Conv_AngleDegrees_Heading.vi | | |
| | Χ | X | Χ | Χ | SI | | | Conv_AngleRadians_Heading.vi | | |
| | X | Χ | Χ | Χ | SI | | | Conv_Centimeters_Meters.vi | | |
| | X | Χ | Χ | Χ | SI | | | Conv_Deg_Radians.vi | | |

| ne interp | olatabl | e routi | ines. | | | |
|-----------|---------|---------|-------|----|------------------------------|--|
| X | Χ | Χ | X | SI | Conv_Deg_Rotations.vi | |
| X | X | X | Χ | SI | Conv_Feet_Meters.vi | |
| X | Χ | Χ | X | SI | Conv_GyroDegrees_Heading.vi | |
| X | Χ | X | X | SI | Conv_Heading_AngleRadians.vi | |
| X | X | X | Χ | SI | Conv_Inches_Meters.vi | |
| X | X | X | Χ | SI | Conv_Kilograms_Pounds.vi | |
| X | Χ | Χ | X | SI | Conv_Meters_Feet.vi | |
| X | Χ | Χ | X | SI | Conv_Meters_Inches.vi | |
| X | Χ | X | X | SI | Conv_Pose2d_SI_Eng.vi | |
| X | Χ | X | X | SI | Conv_Pounds_Kilograms.vi | |
| X | Χ | Χ | Χ | SI | Conv_Radians_Deg.vi | |
| X | Χ | Χ | X | SI | Conv_Radians_Rotations.vi | |
| X | Χ | X | X | SI | Conv_Rotations_Deg.vi | |
| X | Χ | Χ | X | SI | Conv_Rotations_Radians.vi | |
| X | Χ | X | X | SI | Conv_Yards_Meters.vi | |

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

'======== PATHFINDER UTIL

'=======

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

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

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

FRC_LabVIEW_Trajectory_Library_Routines.xlsx Page 21 / 36

| The Law The Joseph Living Commence Living Comm |
|--|
| Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. |

XX

X X

XX

X X

XX

XX

XX

X

X

Χ

Χ

Χ

X

X

| t model follower and time | interp | olatab | le rout | ines. | | | | | | | | | |
|---------------------------|-------------|------------|------------|-----------|---------------------|--------------|----------------|--|-------------------|-----------------------------|-------------|--------------|----------------|
| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | VI Name Fr | unction Prototype | Notes | Code Review | Test Program | Error Checking |
| DC MOTOR | X | X | | X | SI | | | DCMotor_GetAndymark9015.vi | , | | | | |
| | X | Χ | | X | SI | | | DCMotor_GetAndymarkRs775_125.vi | | | | | |
| | Χ | Χ | | X | SI | | | DCMotor_GetBag.vi | | | | | |
| | Χ | Χ | | X | SI | | | DCMotor_GetBanebotsRs550.vi | | | | | |
| | Χ | Χ | | X | SI | | | DCMotor GetBanebotsRs775.vi | | | | | |
| | X | Χ | | X | SI | | | DCMotor_GetCIM.vi | | | | | |
| | Χ | Χ | | X | SI | | | DCMotor GetCurrent.vi | | | | | |
| | Χ | Χ | | X | SI | | | DCMotor GetFalcon500.vi | | | | | |
| | Χ | Χ | | X | SI | | | DCMotor_GetMiniCIM.vi | | | | | |
| | Χ | Χ | | X | SI | | | DCMotor_GetNEO.vi | | | | | |
| | Χ | Χ | | Χ | SI | | | DCMotor GetNEO550.vi | | | | | |
| | Χ | Χ | | X | SI | | | DCMotor GetRomiBuiltIn.vi | | | | | |
| | Χ | Χ | | X | SI | | | DCMotor GetVex775Pro.vi | | | | | |
| | Χ | Χ | | X | SI | | | DCMotor_New.vi | | | | | |
| | X | Χ | | X | SI | | | DCMotor_PickMotor.vi | | | | | |
| | | | | | | | | | | | | | |
| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | | | unction Prototype | Notes | Code Review | Test Program | Error Checking |
| LINEAR SYSTEM ID | | X | | X | | | | LinearSystemId_CreateDCMotorSystem.vi | | | | | |
| | | V | 1 | | | | 1 | Linear Cystem Id Create Drive Train Valenity Cystem vi | | Undata to usa areata matrix | | | |

Update to use create matrix

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

> Menu Item Function Prototype Notes DIFFERENTIAL DRIVE POSE ESTIMATOR X X Χ DiffDrivePoseEst AddVisionMeasurement.vi XX Χ DiffDrivePoseEst FillStateVector.vi X X Χ DiffDrivePoseEst GetEstimatedPosition.vi XX DiffDrivePoseEst Kalman F Callback.vi X XX X DiffDrivePoseEst Kalman H Callback.vi XX DiffDrivePoseEst New.vi Χ XX DiffDrivePoseEst ResetPosition.vi Χ Χ Χ X DiffDrivePoseEst_SetVisionMeasurementStdDevs.vi Χ Χ Χ DiffDrivePoseEst_Update.vi X X X DiffDrivePoseEst UpdateWithTime.vi DiffDrivePoseEst VisionCorrect Callback.vi X X X DiffDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi XX X

LinearSystemId CreateDriveTrainVelocitySystem.vi

LinearSystemId_CreateSingleJointedArmSystem.vi

LinearSystemId CreateElevatorSystem.vi

LinearSystemId CreateFlywheelSystem.vi

LinearSystemId_IdentifyDriveTrainSystem.vi

LinearSystemId_IdentifyPositionSystem.vi

LinearSystemId_IdentifyVelocitySystem.vi

| abVIEW Trajectory Library – VI Implementation I | List | | | | | | | | | | |
|---|----------|-------------|------------|---------------------|--------------|-------------|---|-------------------------------|-------------|--------|-----------|
| 2.X 5/2/2022 – added implicit model follower and time | interpol | latable | routin | es. | | | | | | | |
| | | | | mize | | Ē | | | | | |
| | þ | þ | m | Optii | . e | ogra | | | × | ШE | Checking |
| | ente | ocumente | Not WPILIB | Item Ition (| Test Routine | Sample Prog | | | Revie | Progra | hec |
| | olem | unc | Ŋ. | enu Iten ecution | st Re | эјди | | | de F | st Pı | 9, 0 |
| | | Ď | | E X | Tes | Sar | 71 | Notes | | Test | Err |
| EXTENDED KALMAN FILTER | | | | X | | | ExtendedKalmanFilter_Correct_OnlyUY.vi | luck a aball making stignal | | | |
| | X | X | | X X | | | ExtendedKalmanFilter_Correct.vi ExtendedKalmanFilter GetP Single.vi | Just a shell, not functional! | | | |
| | X | X | | X | | | ExtendedKalmanFilter_GetP.vi | | | | |
| | X | | | X | | | ExtendedKalmanFilter_GetXHat_Single.vi | | | | |
| | X | X | | X X | | | ExtendedKalmanFilter_GetXHat.vi ExtendedKalmanFilter New.vi | | | | |
| | | X | | X | | | ExtendedKalmanFilter_Predict.vi | | | | |
| | | X | | Χ | | | ExtendedKalmanFilter_Reset.vi | | | | |
| | | X | | X X | | | ExtendedKalmanFilter_SetP.vi ExtendedKalmanFilter_SetXHat_Single.vi | | | | |
| | X | | | X | | | ExtendedKalmanFilter SetXHat.vi | | | | |
| | | | | | | | | | | | |
| | | | | Ø. | | | | | | | |
| | | | | ηize | | 2 | | | | | |
| | Ø | 75 | | ptin | . 0 | grar | | | \$ | 8 | ing |
| | ute | ntec | L/B | Item tion O | utine | Progi | | | evie. | gra | eck |
| | plement | ocnmen | WPILIB | nu Item cution | Test Routine | mple | | | e A | Progr | ર્ટ |
| | Jdu |))) | \ot | Menu Execu | rest | Sam | VI Name Function Prototype | Notes | Sode | Test | irro 1 |
| KALMAN FILTER | X | X | | X | X | | KalmanFilter_Correct.vi | | | | - 4 |
| | | X | | X | | | KalmanFilter_GetK | | | | |
| | | X | | X X | | | KalmanFilter_GetK_Single.vi KalmanFilter GetXHat | | | | |
| | | X | | X | X | | KalmanFilter_GetXHaT_Single | | | | |
| | | X | | X | X | | KalmanFilter_New.vi | | | | |
| | | X | | X X | X | | KalmanFilter_Predict.vi KalmanFilter Reset.vi | | | | |
| | | X | | X | | | KalmanFilter_SetXHat | | | | |
| | Χ | X | | X | Х | | KalmanFilter_SetXHat_Single | | | | |
| | | | | | | | | | | | |
| | | | | ρą | | | | | | | |
| | | | | miz | | E E | | | | | ~ |
| | pe | þ | m | Opti | 9 | ogra | | | N O | am | king |
| | ent | ente | vot WPILIB | ou Item | Routine | P | | | Se Vi | Progra | hec |
| | прІете | cume | Ŋ. | nu 1 | ž Š | Sample | | | de F | | 9,0 |
| | 2 | 7 | | Menu Execu | Test | | | Notes | <u>Š</u> | Test | Err |
| KALMAN FILTER LATENCY COMPENSATOR | | X | | X X | | | KalmanFilterLatencyComp_AddObserverState.vi | | | | |
| | | X | | ^ | | | KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi | | | | |
| | X | X | | X | | | KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.vi | | | | |
| | X | Х | | Х | | | KalmanFilterLatencyComp_FindClosestMeasurement.vi | | | | |
| | X | X | | Χ | | | KalmanFilterLatencyComp_New.vi | | | | |
| | X | | | X X | | | KalmanFilterLatencyComp_Observer_New.vi | | | | |
| | Χ | Χ | | X | | | KalmanFilterLatencyComp_Reset.vi | | | | |
| | | | | <i>pe</i> | | | | | | | |
| | | | | imiz | | ш | | | | | 2 |
| | pə | þə | 9 | Opt | Je J | ogre | | | é. | am | king |
| | nent | ent | WPILIB | ltem tion | Routine | 9 Pr | | | Revi | Progra | hec |
| | претеп | Documen | ž | Menu I Execut | st R | mple | | | de f | st P. | .or C |
| | | 8_ | Not | <u>Ř</u> <u>Ř</u> | Test | | | Notes | 8 | Test | Err |
| MECANUM DRIVE POSE ESTIMATOR | X | Y | - | X | | | MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi MecaDrivePoseEst_AddVisionMeasurement.vi | | | | |
| | ^ | ^ | | ^ | | | INICCADITYCF OSCIDI_AUDVISIONINICASUI CITICILL.VI | | | | |

| | , | , | , , | | |
|--------------|--------------|-------------|---------------|---------------------------------------|--|
| D | = 1010000 | | | | |
| Revision 2.X | 5/2/2022 – 3 | added impli | icit model fo | wer and time interpolatable routines. | |

| mile mileip | Olatab | ie routiries. | | |
|-------------|--------|---------------|--|---|
| X | Χ | X | | MecaDrivePoseEst_GetEstimatedPosition.vi |
| X | Χ | No | | MecaDrivePoseEst_Kalman_F_Callback.vi |
| X | Χ | No | | MecaDrivePoseEst_Kalman_H_Callback.vi |
| X | Χ | X | | MecaDrivePoseEst_New.vi |
| X | X | X | | MecaDrivePoseEst_ResetPosition.vi |
| X | Χ | X | | MecaDrivePoseEst_SetVisionMeasurementStdDevs.vi |
| X | Χ | X | | MecaDrivePoseEst_Update.vi |
| X | Χ | X | | MecaDrivePoseEst_UpdateWithTime.vi |
| X | Χ | No | | MecaDrivePoseEst_VisionCorrect_Callback.vi |
| X | Χ | No | | MecaDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi |
| | | | | |

| | Implemented | Documented | Not WPILIB Menu Item | Execution Optimized | Test Routine | Sample Program | | Code Review | Test Program | Error Checking |
|-----------------------------|---------------------------------------|---|------------------------|---------------------|--------------|--|---|-------------|--------------|----------------|
| SWERVE DRIVE POSE ESTIMATOR | | | | | | | veDrivePoseEst_AddVisionMeasurement_StdDev.vi | | | |
| | | Χ | X | | | | veDrivePoseEst_AddVisionMeasurement.vi | | | |
| | | X | X | | | | veDrivePoseEst_GetEstimatedPosition.vi | | | |
| - | X | X | X | | | | veDrivePoseEst_Kalman_F_Callback.vi | | | |
| | X | X | X | | | | veDrivePoseEst_Kalman_H_Callback.vi | | | |
| | | X | X | | | | rveDrivePoseEst_New.vi | | | |
| - | | X | X | | | | veDrivePoseEst_ResetPosition.vi | | | |
| - | | X | X | | | | veDrivePoseEst_SetVisionMeasurementStdDevs.vi | | | |
| - | X | X | X | | | | rveDrivePoseEst_Update.vi | | | |
| | X | X | X | | | | rveDrivePoseEst_UpdateWithTime.vi | | | |
| | | X | X | | | | rveDrivePoseEst_VisionCorrect_Callback.vi | | | |
| | Χ | X | X | | | Swer | veDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi | | | |
| | | | | nized | | 8 | | | | |
| | nplemented | ocumented | ot WPILIB Ienu Item | xecution Optimized | est Routine | ample Program | Expedies Destators | ode Review | est Program | rror Checking |
| UNISCENTED KALMAN EILTED | <pre>/ Implemented</pre> | | Not WPILIB Menu Item | Execution Optimized | Test Routine | Sample N IS | | Code Review | Test Program | Error Checking |
| UNSCENTED KALMAN FILTER | X | X | X | | Test Routine | N IV Samble | entedKalmanFilter Correct FuncGroup.vi | Code Review | Test Program | Error Checking |
| UNSCENTED KALMAN FILTER | X | X | X | | Test Routine | Unsc Unsc | pentedKalmanFilter_Correct_FuncGroup.vi | Code Review | Test Program | Error Checking |
| UNSCENTED KALMAN FILTER | X X X | X X X | X | | Test Routine | VI Na Unsc | tentedKalmanFilter_Correct_FuncGroup.vi tentedKalmanFilter_Correct_OnlyUY.vi tentedKalmanFilter_Correct_OnlyUYR.vi | Code Review | Test Program | Error Checking |
| UNSCENTED KALMAN FILTER | X X X X | X X X | X X X | | Test Routine | VI Na Unsc Unsc Unsc | tentedKalmanFilter_Correct_FuncGroup.vi tentedKalmanFilter_Correct_OnlyUY.vi tentedKalmanFilter_Correct_OnlyUYR.vi tentedKalmanFilter_Correct_OnlyUYR.vi tentedKalmanFilter_Correct.vi | Code Review | Test Program | Error Checking |
| UNSCENTED KALMAN FILTER | X X X X | X X X X X | X X X X | | Test Routine | Unsc Unsc Unsc Unsc Unsc Unsc | tentedKalmanFilter_Correct_FuncGroup.vi tentedKalmanFilter_Correct_OnlyUY.vi tentedKalmanFilter_Correct_OnlyUYR.vi tentedKalmanFilter_Correct.vi tentedKalmanFilter_GetP_Single.vi | Code Review | Test Program | Error Checking |
| UNSCENTED KALMAN FILTER | X X X X X | X X X X X | X X X X | | Test Routine | Unsc Unsc Unsc Unsc Unsc Unsc Unsc | tentedKalmanFilter_Correct_FuncGroup.vi tentedKalmanFilter_Correct_OnlyUY.vi tentedKalmanFilter_Correct_OnlyUYR.vi tentedKalmanFilter_Correct.vi tentedKalmanFilter_GetP_Single.vi tentedKalmanFilter_GetP.vi | Code Review | Test Program | Error Checking |
| UNSCENTED KALMAN FILTER | X X X X X X | X X X X X X | X X X X X | | Test Routine | Unsc Unsc Unsc Unsc Unsc Unsc Unsc Unsc | tentedKalmanFilter_Correct_FuncGroup.vi tentedKalmanFilter_Correct_OnlyUY.vi tentedKalmanFilter_Correct_OnlyUYR.vi tentedKalmanFilter_Correct.vi tentedKalmanFilter_GetP_Single.vi tentedKalmanFilter_GetP.vi tentedKalmanFilter_GetXHat_Single.vi | Code Review | Test Program | Error Checking |
| UNSCENTED KALMAN FILTER | X X X X X X X | X X X X X X X | X | | Test Routine | Unsc Unsc Unsc Unsc Unsc Unsc Unsc Unsc | tentedKalmanFilter_Correct_FuncGroup.vi tentedKalmanFilter_Correct_OnlyUY.vi tentedKalmanFilter_Correct_OnlyUYR.vi tentedKalmanFilter_Correct.vi tentedKalmanFilter_GetP_Single.vi tentedKalmanFilter_GetP.vi tentedKalmanFilter_GetXHat_Single.vi tentedKalmanFilter_GetXHat_Single.vi tentedKalmanFilter_GetXHat_Single.vi | Code Review | Test Program | Error Checking |
| UNSCENTED KALMAN FILTER | X X X X X X X X | X | X | | Test Routine | Unsc Unsc Unsc Unsc Unsc Unsc Unsc Unsc | tentedKalmanFilter_Correct_FuncGroup.vi tentedKalmanFilter_Correct_OnlyUY.vi tentedKalmanFilter_Correct_OnlyUYR.vi tentedKalmanFilter_Correct.vi tentedKalmanFilter_GetP_Single.vi tentedKalmanFilter_GetP.vi tentedKalmanFilter_GetXHat_Single.vi tentedKalmanFilter_GetXHat_Single.vi tentedKalmanFilter_GetXHat_Ni tentedKalmanFilter_New_Default.vi | Code Review | Test Program | Error Checking |
| UNSCENTED KALMAN FILTER | X X X X X X X X X X X X X X X X X X X | X | X | | Test Routine | VI Na Unsc Unsc Unsc Unsc Unsc Unsc Unsc Unsc | tentedKalmanFilter_Correct_FuncGroup.vi tentedKalmanFilter_Correct_OnlyUY.vi tentedKalmanFilter_Correct_OnlyUYR.vi tentedKalmanFilter_Correct.vi tentedKalmanFilter_GetP_Single.vi tentedKalmanFilter_GetP.vi tentedKalmanFilter_GetXHat_Single.vi tentedKalmanFilter_GetXHat_Single.vi tentedKalmanFilter_GetXHat.vi tentedKalmanFilter_New_Default.vi tentedKalmanFilter_New_FuncGroup.vi | Code Review | Test Program | Error Checking |
| UNSCENTED KALMAN FILTER | X X X X X X X X X X X X X X X 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 | VI Na Unsc Unsc Unsc Unsc Unsc Unsc Unsc Unsc | tentedKalmanFilter_Correct_FuncGroup.vi tentedKalmanFilter_Correct_OnlyUY.vi tentedKalmanFilter_Correct_OnlyUYR.vi tentedKalmanFilter_Correct.vi tentedKalmanFilter_GetP_Single.vi tentedKalmanFilter_GetP_Single.vi tentedKalmanFilter_GetP.vi tentedKalmanFilter_GetXHat_Single.vi tentedKalmanFilter_GetXHat.vi tentedKalmanFilter_New_Default.vi tentedKalmanFilter_New_FuncGroup.vi tentedKalmanFilter_New.vi | Code Review | Test Program | Error Checking |
| UNSCENTED KALMAN FILTER | X X X X X X X X X X X X X X X 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 | Unsc Unsc Unsc Unsc Unsc Unsc Unsc Unsc | tentedKalmanFilter_Correct_FuncGroup.vi tentedKalmanFilter_Correct_OnlyUY.vi tentedKalmanFilter_Correct_OnlyUYR.vi tentedKalmanFilter_Correct.vi tentedKalmanFilter_GetP_Single.vi tentedKalmanFilter_GetP_Single.vi tentedKalmanFilter_GetP.vi tentedKalmanFilter_GetXHat_Single.vi tentedKalmanFilter_GetXHat.vi tentedKalmanFilter_New_Default.vi tentedKalmanFilter_New_FuncGroup.vi tentedKalmanFilter_New.vi tentedKalmanFilter_New.vi tentedKalmanFilter_Predict.vi | Code Review | Test Program | Error Checking |
| UNSCENTED KALMAN FILTER | X X X X X X X X X X X X X X X X X X X | X | X | | Test Routine | Unsc Unsc Unsc Unsc Unsc Unsc Unsc Unsc | tentedKalmanFilter_Correct_FuncGroup.vi tentedKalmanFilter_Correct_OnlyUY.vi tentedKalmanFilter_Correct_OnlyUYR.vi tentedKalmanFilter_Correct.vi tentedKalmanFilter_GetP_Single.vi tentedKalmanFilter_GetP_Single.vi tentedKalmanFilter_GetP.vi tentedKalmanFilter_GetXHat_Single.vi tentedKalmanFilter_GetXHat.vi tentedKalmanFilter_New_Default.vi tentedKalmanFilter_New_Default.vi tentedKalmanFilter_New_FuncGroup.vi tentedKalmanFilter_New.vi tentedKalmanFilter_Predict.vi tentedKalmanFilter_Predict.vi tentedKalmanFilter_Predict.vi | Code Review | Test Program | Error Checking |
| UNSCENTED KALMAN FILTER | X X X X X X X X X X X X X X X 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 | VI Na Unsc Unsc Unsc Unsc Unsc Unsc Unsc Unsc | rentedKalmanFilter_Correct_FuncGroup.vi rentedKalmanFilter_Correct_OnlyUY.vi rentedKalmanFilter_Correct_OnlyUYR.vi rentedKalmanFilter_Correct.vi rentedKalmanFilter_GetP_Single.vi rentedKalmanFilter_GetP_Single.vi rentedKalmanFilter_GetP.vi rentedKalmanFilter_GetXHat_Single.vi rentedKalmanFilter_GetXHat.vi rentedKalmanFilter_New_Default.vi rentedKalmanFilter_New_Default.vi rentedKalmanFilter_New.vi rentedKalmanFilter_New.vi rentedKalmanFilter_Predict.vi rentedKalmanFilter_Reset.vi rentedKalmanFilter_Reset.vi rentedKalmanFilter_SetP.vi | Code Review | Test Program | Error Checking |
| UNSCENTED KALMAN FILTER | X X X X X X X X X X X X X X X X X X X | X | X | | Test Routine | Unscience of the control of the cont | tentedKalmanFilter_Correct_FuncGroup.vi tentedKalmanFilter_Correct_OnlyUY.vi tentedKalmanFilter_Correct_OnlyUYR.vi tentedKalmanFilter_Correct.vi tentedKalmanFilter_GetP_Single.vi tentedKalmanFilter_GetP_Single.vi tentedKalmanFilter_GetP.vi tentedKalmanFilter_GetXHat_Single.vi tentedKalmanFilter_GetXHat.vi tentedKalmanFilter_New_Default.vi tentedKalmanFilter_New_Default.vi tentedKalmanFilter_New_FuncGroup.vi tentedKalmanFilter_New.vi tentedKalmanFilter_Predict.vi tentedKalmanFilter_Predict.vi tentedKalmanFilter_Predict.vi | Code Review | Test Program | Error Checking |
| UNSCENTED KALMAN FILTER | X | X | X | | Test Routine | VI Na Unsc Unsc Unsc Unsc Unsc Unsc Unsc Unsc | rentedKalmanFilter_Correct_FuncGroup.vi rentedKalmanFilter_Correct_OnlyUY.vi rentedKalmanFilter_Correct_OnlyUYR.vi rentedKalmanFilter_Correct_Vi rentedKalmanFilter_GetP_Single.vi rentedKalmanFilter_GetP_Single.vi rentedKalmanFilter_GetXHat_Single.vi rentedKalmanFilter_GetXHat_vi rentedKalmanFilter_New_Default.vi rentedKalmanFilter_New_FuncGroup.vi rentedKalmanFilter_New.vi rentedKalmanFilter_New.vi rentedKalmanFilter_Predict.vi rentedKalmanFilter_Reset.vi rentedKalmanFilter_SetY.vi rentedKalmanFilter_SetY.vi rentedKalmanFilter_SetY.vi rentedKalmanFilter_SetXHat_Single.vi | Code Review | Test Program | Error Checking |

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

FRC_LabVIEW_Trajectory_Library_Routines.xlsx

Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. Function Prototype Notes CONTROL AFFINE PLANT INVERSION FEEDFORWARD Function Prototype Notes DIFFERENTIAL DRIVE ACCELERATION LIMITER X DiffDrvAccelLimit_Calculate.vi X DiffDrvAccelLimit New.vi Function Prototype Notes IMPLICIT MODEL FOLLOWER X Χ ImplModelFollow_Calculate.vi X ImplModelFollow GetU.vi Χ X ImplModelFollow_GetU_Single.vi Χ X ImplModelFollow New.vi X Χ ImplModelFollow_New_Plant.vi Χ X Χ Χ ImplModelFollow_Reset.vi Function Prototype Notes LINEAR PLANT INVERSION FEEDFORWARD X Χ X LinearPIntInvFF Calculate NextR.vi X LinearPIntInvFF Calculate.vi Χ X LinearPIntInvFF GetR Single.vi Χ Χ Χ LinearPIntInvFF_GetR.vi X X Χ LinearPIntInvFF_GetUff_Single.vi X X X LinearPIntInvFF GetUff.vi XX Χ LinearPIntInvFF_New_Plant.vi XX X LinearPIntInvFF New.vi XX Χ LinearPIntInvFF Reset Initial.vi LinearPIntInvFF Reset Zero.vi XX Χ Function Prototype Notes LINEAR QUADRATIC REGULATOR X LinearQuadraticRegulator_Calculate_NextR.vi X X X LinearQuadraticRegulator_Calculate.vi X Χ X NOT ORIGINAL Χ Χ LinearQuadraticRegulator_GetK_Single.vi Χ Χ LinearQuadraticRegulator_GetK.vi

FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time interpretations of the interpretation of the control
| ne <u>interp</u> | olatabl | e routines. | | | |
|------------------|---------|-------------|---|---|---------------------------------|
| X | X | X | | LinearQuadraticRegulator_GetR_Single.vi | |
| X | X | X | | LinearQuadraticRegulator_GetR.vi | |
| X | X | X | | LinearQuadraticRegulator_GetU_Single.vi | |
| X | X | X | | LinearQuadraticRegulator_GetU.vi | |
| / | X | X | Χ | LinearQuadraticRegulator_LatencyCompensate.vi | Routine exists, but it only has |
| | | | | | interger raise matrix to power. |
| X | X | X | | LinearQuadraticRegulator_New_ELMS.vi | |
| X | X | X | | LinearQuadraticRegulator_New_N.vi | |
| | | | | LinearQuadraticRegulator_New_Raw.vi | |
| X | X | X | Χ | LinearQuadraticRegulator_New_SystemELMS.vi | |
| X | X | X | | LinearQuadraticRegulator_New.vi | |
| X | X | X | | LinearQuadraticRegulator_Reset.vi | |
| | | | | | |
| | | | | | |

| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | Function Prototype | Notes | Code Review | Test Program | Error Checking |
|---------------|-------------|------------|------------|-----------|---------------------|--------------|-----------------------------|--------------------|-------|-------------|--------------|----------------|
| LINEAR SYSTEM | Χ | Χ | | X | - 1 | | LinearSystem_CalculateX.vi | | | | | |
| | Χ | X | | X | - 1 | | LinearSystem_CalculateY.vi | | | | | |
| | Χ | X | | X | SI | | LinearSystem_GetA.vi | | | | | |
| | X | X | | X | SI | | LinearSystem_GetAElement.vi | | | | | |
| | X | X | | X | SI | | LinearSystem_GetB.vi | | | | | |
| | Χ | X | | X | SI | | LinearSystem_GetBElement.vi | | | | | |
| | X | X | | X | SI | | LinearSystem_GetC.vi | | | | | |
| | X | X | | X | SI | | LinearSystem_GetCElement.vi | | | | | |
| | Χ | X | | X | SI | | LinearSystem_GetD.vi | | | | | |
| | X | X | | X | SI | | LinearSystem_GetDElement.vi | | | | | |
| | Χ | Χ | | Χ | SI | | LinearSystem_New.vi | | | | | |
| | | | | | | | | | | | | |

| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample And Andrews VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
|--------------------|-------------|------------|------------|-----------|---------------------|--------------|---|--------------------|-------|-------------|--------------|----------------|
| LINEAR SYSTEM LOOP | X | Χ | | Χ | | | LinearSystemLoop_ClampInput.vi | | | | | |
| | X | Χ | | Χ | | | LinearSystemLoop_Correct.vi | | | | | |
| | | | | | | | LinearSystemLoop_GetClampFunction.vi | | | | | |
| | Χ | Χ | | Χ | | | LinearSystemLoop_GetController.vi | | | | | |
| | Χ | Χ | | Χ | | | LinearSystemLoop_GetError_Single.vi | | | | | |
| | Χ | Χ | | Χ | | | LinearSystemLoop_GetError.vi | | | | | |
| | Χ | Χ | | Χ | | | LinearSystemLoop_GetFeedForward.vi | | | | | |
| | Χ | Χ | | Χ | | | LinearSystemLoop_GetNextR_Single.vi | | | | | |
| | Χ | X | | Χ | | | LinearSystemLoop_GetNextR.vi | | | | | |
| | Χ | X | | Χ | | | LinearSystemLoop_GetObserver.vi | | | | | |
| | Χ | Χ | | Χ | | | LinearSystemLoop_GetU_Row.vi | | | | | |
| | Χ | Χ | | Χ | | | LinearSystemLoop_GetU.vi | | | | | |
| | Χ | X | | Χ | | | LinearSystemLoop_GetXHat_Single.vi | | | | | |
| | Χ | Χ | | Χ | | | LinearSystemLoop_GetXHat.vi | | | | | |
| | | | | | | | LinearSystemLoop_New_BBB | | | | | |
| | | | | | | | LinearSystemLoop_New_LinearSystem_ClampFunc | | | | | |
| | X | X | | Χ | | | LinearSystemLoop_New_LinearSystem_ClampVal.vi | | | | | |
| | X | X | | Χ | | | LinearSystemLoop_New.vi | | | | | |
| | X | X | | X | | | LinearSystemLoop_Predict.vi | | | | | |
| | Χ | X | | Χ | | | LinearSystemLoop_Reset.vi | | | | | |
| | | | | | | | LinearSystemLoop_SetClampFunction.vi | | | | | |
| | | | | | | | LinearSystemLoop_SetNextR_Some.vi | | | | | |
| | Χ | X | | Χ | | | LinearSystemLoop_SetNextR.vi | | | | | |
| | | | | | | | LinearSystemLoop_SetXHat_Single.vi | | | | | |

Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. LinearSystemLoop SetXHat.vi Function Prototype Notes LTV DIFFERENTIAL DRIVE CONTROLLER LTVDiffDriveCtrl Calculate.vi Χ Χ X X LTVDiffDriveCtrl New.vi X Χ LTVDiffDriveCtrl_Calculate_TrajState.vi LTVDiffDriveCtrl_Calculate_SetTolerance.vi Χ X LTVDiffDriveCtrl Calculate AtReference.vi Χ Function Prototype Notes LTV UNICYCLE CONTROLLER X Χ X LTVUnicycleCtrl_AtReference.vi X LTVUnicycleCtrl Calculate Orig.vi This one computes a new LQR each time. X LTVUnicycleCtrl Calculate TrajState Orig.vi This one computes a new LQR Χ X X each time. Χ LTVUnicycleCtrl_Calculate_TrajState.vi X X Χ Χ Χ LTVUnicycleCtrl_Calculate.vi LTVUnicycleCtrl_New.vi Χ X X LTVUnicycleCtrl SetEnabled.vi X Χ Χ LTVUnicycleCtrl SetTolerance.vi X X '======== STATE SPACE UTILITIES '======== Function Prototype Notes X CALLBACK HELPER X X X CallbackHelp MatrixMinus.vi XX CallbackHelp MatrixMult CoerceSizeB.vi X X X CallbackHelp_MatrixMult.vi X X X X CallbackHelp MatrixPlus.vi ltem Function Prototype Notes DISCRETIZATION X Discretization_DiscretizeA.vi X Χ X XX X X Discretization DiscretizeAB.vi Discretization DiscretizeABTaylor.vi XX Χ Χ XX Discretization DiscretizeAQ.vi Χ X X X Discretization DiscretizeAQTaylor.vi Χ X Discretization_DiscretizeR.vi XX Χ

FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. Function Prototype STATE SPACE UTIL X X StateSpaceUtil_Check_Stabalizable.vi X No Internal routine Χ StateSpaceUtil ClampInputMaxMagnitude.vi Χ X Routine exists, it is just a shell XX Χ StateSpaceUtil IsDetectable.vi XX Χ StateSpaceUtil IsStabalizable.vi StateSpaceUtil MakeCostMatrix.vi XX Χ XX StateSpaceUtil MakeCovarianceMatrix.vi X XX StateSpaceUtil_MakeWhiteNoiseVector.vi X StateSpaceUtil NomalizeInputVector.vi Χ X Χ Χ Χ StateSpaceUtil PoseTo3dVector.vi Χ Χ Χ Χ StateSpaceUtil PoseTo4dVector.vi StateSpaceUtil PoseToVector.vi X X X '======== SIMULATION '======= Function Prototype Notes BATTERY SIM X X BatterySim CalculateDefaultBatteryLoadedVoltage.vi X SI X SI BatterySim CalculateLoadedVoltage.vi $X \mid X$ Function Prototype DC MOTOR SIM X DCMotorSim_getAngularPositionRad.vi X Χ DCMotorSim_getAngularPositionRotations.vi Χ Χ X Χ Χ Χ DCMotorSim_getAngularVelocityRadPerSec.vi X Χ Χ DCMotorSim_getAngularVelocityRPM.vi X X DCMotorSim GetCurrentDrawAmps.vi Χ X Χ DCMotorSim New MOI.vi Χ X X DCMotorSim New Plant.vi Χ Χ DCMotorSim_SetInputVoltage.vi Χ X X Χ DCMotorSim Update.vi Function Prototype Notes DiffDriveTrainSim_ClampInput.vi DIFFERENTIAL DRIVE TRAIN SIM X X X XX Χ DiffDriveTrainSim CreateKitbotSim EstMass.vi

DiffDriveTrainSim CreateKitbotSim EstMassMOI.vi

DiffDriveTrainSim CreateKitbotSim.vi

DiffDriveTrainSim GetCurrentDrawAmps.vi

XX

XX

X X

Χ

Χ

X

| The Eablie Trajectory Library Transferrentiation | _131 | | | | | | | | | | | | | |
|---|------|---|--|---|--|--|--|--|--|--|--|--|--|--|
| Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. | | | | | | | | | | | | | | |
| | Χ | Χ | | X | | | DiffDriveTrainSim_GetCurrentGearing.vi | | | | | | | |
| | | | | | | | | | | | | | | |

| ie interp | Diatable Tou | uncs. | | | | |
|-----------|--------------|-------|--|--|--|--|
| X | Χ | X | | DiffDriveTrainSim_GetCurrentGearing.vi | | |
| X | Χ | X | | DiffDriveTrainSim_GetDynamics.vi | | |
| X | Χ | X | | DiffDriveTrainSim_GetHeading.vi | | |
| X | Χ | X | | DiffDriveTrainSim_GetLeftCurrentDrawAmps.vi | | |
| X | X | X | | DiffDriveTrainSim_GetLeftPositionMeters.vi | | |
| X | X | X | | DiffDriveTrainSim_GetLeftVelocityMetersPerSecond.vi | | |
| X | Χ | X | | DiffDriveTrainSim_GetOutput_Single.vi | | |
| X | Χ | X | | DiffDriveTrainSim_GetPose.vi | | |
| X | X | X | | DiffDriveTrainSim_GetRightCurrentDrawAmps.vi | | |
| X | Χ | X | | DiffDriveTrainSim_GetRightPositionMeters.vi | | |
| X | X | X | | DiffDriveTrainSim_GetRightVelocityMetersPerSecond.vi | | |
| X | X | X | | DiffDriveTrainSim_GetState_Single.vi | | |
| X | X | X | | DiffDriveTrainSim_GetState.vi | | |
| X | X | X | | DiffDriveTrainSim_KitBotWheelSize.vi | | |
| X | Χ | X | | DiffDriveTrainSim_New_Mass_MOI.vi | | |
| X | X | X | | DiffDriveTrainSim_New.vi | | |
| X | X | X | | DiffDriveTrainSim_SetCurrentGearing.vi | | |
| X | X | X | | DiffDriveTrainSim_SetInputs.vi | | |
| X | X | X | | DiffDriveTrainSim_SetPose.vi | | |
| X | X | X | | DiffDriveTrainSim_SetState.vi | | |
| X | Χ | X | | DiffDriveTrainSim_ToughBoxMiniGearRatio.vi | | |
| X | Χ | X | | DiffDriveTrainSim_ToughBoxMiniMotor.vi | | |
| X | Χ | X | | DiffDriveTrainSim_Update.vi | | |
| | | | | | | |
| | | | | | | |

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

| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
|--------------|-------------|------------|------------|-----------|---------------------|--------------|----------------|--|--------------------|--------|-------------|--------------|----------------|
| FLYWHEEL SIM | Χ | X | | Χ | | | | FlyWheelSim_GetAngularVelocityRadPerSec.vi | | | | | |
| | Χ | X | | Χ | | | | FlyWheelSim_GetAngularVelocityRPM.vi | | | | | |
| | Χ | X | | Χ | | | | FlyWheelSim_GetCurrentDrawAmps | | | | | |
| | | | | | | | | FlyWheelSim_New_LinSys | | Future | | | |
| | | | | | | | | FlyWheelSim_New_LinSys_MOI_NoNoise | | Future | | | |
| | | | | | | | | FlyWheelSim_New_LinSys_NoNoise | | Future | | | |
| | Χ | X | | Χ | | | | FlyWheelSim_New_MOI.vi | | | | | |
| | Χ | X | | Χ | | | | FlyWheelSim_SetInput.vi | | | | | |
| | X | X | | Χ | | | | FlvWheelSim SetState.vi | | | | | |

Revision 2.X 5/2/2022 – added implicit model follower and time interpolatable routines. FlyWheelSim Update.vi Function Prototype VI Name Notes LINEAR SYSTEM SIM X LinearSystemSim_ClampInput.vi LinearSystemSim GetCurrentDrawAmps.vi DONT IMPLEMENT.. Χ Χ LinearSystemSim_GetOutput_Single.vi X XX Χ LinearSystemSim GetOutput.vi LinearSystemSim New XX Χ LinearSystemSim New NoNoise.vi LinearSystemSim SetInput Array.vi $X \mid X$ X Doesn't use clamp? XX LinearSystemSim_SetInput_Single.vi X Χ Χ LinearSystemSim_SetInput.vi X Χ Χ LinearSystemSim_Setstate.vi X Χ Χ Χ LinearSystemSim Update.vi LinearSystemSim UpdateX.vi X Χ No X X X No LinearSystemSim UpdateY.vi Menu Item Function Prototype Notes SINGLE JOINT ARM SIM X SngJntArmSim_EsitmateMOI.vi Χ Χ SngJntArmSim GetAngleRads.vi X Χ X SngJntArmSim_GetCurrentDraw.vi Χ Χ X X Χ SngJntArmSim_GetVelocityRadsPerSec.vi X X Χ SngJntArmSim_HasHitLowerLimit.vi XX Χ SngJntArmSim HasHitUpperLimit.vi XX X SngJntArmSim New.vi SngJntArmSim_Rkf45_Func.vi XX No XX X SngJntArmSim_SetInputVoltage.vi XX Χ SngJntArmSim_SetState.vi Χ X Χ SngJntArmSim_Update.vi Χ X X SngJntArmSim_UpdateX.vi Χ SngJntArmSim_WouldHitLowerLimit.vi Χ Χ Χ X X SngJntArmSim WouldHitUpperLimit.vi '========= MATRIX UTILITIES '======== VI Name Function Prototype Notes MAT BUILDER X X Χ SI MatBuilder Create.vi XX X SI MatBuilder Fill.vi

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

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

| odel follower and time i | nterpo | latabl | e routi | ines. | | | | | | | | |
|--------------------------|-------------|------------|------------|-----------|---------------------|--------------|----------------------------------|--------------------|-------|-------------|--------------|----------------|
| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| MATRIX HELPER | X | X | X | X | SI | | MatrixHelper_CooerceSize.vi | | | | | |
| | Χ | Χ | Χ | Χ | SI | | MatrixHelper_MultCooerceBSize.vi | | | | | |
| | Χ | Χ | Χ | Χ | SI | | MatrixHelper_Zero.vi | | | | | |

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

'========

MATH '========

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

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

| | | | | | | σ | | | | | | | |
|---------------------------|---------------------|-----------|-------------|---------------------|-----|------------------------------|----------|--|--------------------|---|--------------|--------------|----------|
| | | | | | | mize | | E | | | | | |
| | þ | Ď | ~ | | ; | Optii D |) | Program : | | | N N | ш | Checking |
| | Implementea | ente | Not WPILIB | ,em | | | | PA | | | evié | Program | hec |
| | lem | Documen | Ŋ | Menu Item | | Execution Test Routi | : | NI Name | | | ð R | ÷ P | |
| | lmp | Doc | Not | Me | | Exec Test | 3 | VI Name | Function Prototype | Notes | Cod | Test | Error |
| MERWE SCALED SIGMA POINTS | | X | | X | | 1 | | MerweScSigPts_ComputeWeights.vi | * * | | | | |
| | X | | | | | SI | | MerweScSigPts_GetNumSigmas.vi | | | | - | |
| | X | | | X | , | SI SI | + | MerweScSigPts_GetWc_Single.vi MerweScSigPts_GetWc.vi | | | | | |
| | X | X | | $\frac{1}{X}$ | | SI | | MerweScSigPts_GetWm_Single.vi | | | | | |
| | X | | | X | | SI | | MerweScSigPts_GetWm.vi | | | | | - |
| | X | | | X | | 1 | | MerweScSigPts_New_Default.vi | | | | | ı |
| | X | X | | X | | 1 | | MerweScSigPts_New.vi MerweScSigPts_SigmaPoints.vi | | | | | |
| | | | | | | • | \top | mornococigi to_orginar cime.vi | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | izea | | | | | | | |
| | | | | | ; | tin Tin | | Program | | | | ~ | б |
| | ited | ted | 18 | ء ! | : ' | ğ ğ |) | 60/ | | | /jew | ıran | cki |
| | mer | nen | Į. | lter | | itior Sou | 5 | A H | | | Rei | 709 | Checking |
| | mplemented | Documente | Not WPILIE | Menu Item | | Execution Op Test Routine | | Name Salah | | | эде | Test Program | Error |
| NUMERICAL INTEGRATION | | | | ∑ | | <u> </u> | <u>'</u> | | Function Prototype | Notes NOT USED. Should this be used | <u>Ğ</u> | | <u> </u> |
| NUMERICAL INTEGRATION | ^ | ^ | | | | ' | | NumIntegrate_Func_Ax_Bu_K.vi | | or abandoned??? | İ | | ı |
| | X | | | X | | | | NumIntegrate_Rk4_Dbl_X_U.vi | | | | | |
| | X | X | | X | · | | - | NumIntegrate_Rk4_Dbl_X.vi NumIntegrate_Rk4_Mat_X_U.vi | | | | | i |
| | X | | | $\frac{\lambda}{X}$ | - | | + | NumIntegrate_Rk4_Mat_X_0.vi | | | | | |
| | X | X | | No | ο , | SI | | NumIntegrate_Rkdp_Func_A.vi | | | | | |
| | X | | | No | ο . | SI | | NumIntegrate_Rkdp_Func_B1.vi | | | | | |
| | X | | | No No | | SI SI | + | NumIntegrate_Rkdp_Func_B1B2.vi NumIntegrate_Rkdp_Func_B2.vi | | | | | <u> </u> |
| | \hat{X} | | | No | , , | 1 | + | Numintegrate_Rkdp_Impl.vi | | | | | |
| | X | X | | X | | | | NumIntegrate_RKDP_Mat_X_U.vi | | New replacement for RKF45 | | | |
| | X | | | No |) , | SI | | NumIntegrate_Rkf45_Func_A.vi | | | | | |
| | X | | | No No | | SI SI | | NumIntegrate_Rkf45_Func_B1.vi NumIntegrate_Rkf45_Func_B1B2.vi | | | | | |
| | $\frac{\hat{x}}{X}$ | | | | | SI | + | NumIntegrate Rkf45 Func B2.vi | | | | | |
| | | | | | | | | NumIntegrate_RKf45_Func_Bs.vi | | Removed. Replaced with newer | | | |
| | | | | | | | | NumIntegrate_RKf45_Func_Ch.vi | | functions. Removed. Replaced with newer | | | |
| | | | | | | | | | | functions. | | | I |
| | | | | | | | | NumIntegrate_RKf45_Func_Ct.vi | | Removed. Replaced with newer | İ | | ı |
| | X | X | | No | , | 1 | + | NumIntegrate_Rkf45_Impl.vi | | functions. | | | |
| | X | X | | X | | | | NumIntegrate_Rkf45_Mat_X_U.vi | | Note that this Feinberg method has | | | |
| | | | | | | | | | | been changed and a Ďormand Price method has been | İ | | ı |
| | | | | | | | | | | implemented TODO | | | |
| | | | | , , | | 01 | | NumIntegrate_RKf45_New.vi | | Removed. Never used. | | | |
| | X | X | X | ' X | , | SI I | _ | NumIntegrate_Trap_Dbl.vi NumIntegrate Trap Mat.vi | | | | | |
| | | | \ \ \ \ \ \ | ^ | | <u>'</u> | | Nummegrate_frap_wat.vi | | | | | |
| | | | | | - | | | | | , | | | |
| | | | | | | zeq | | | | | | | |
| | | | | | , | tini. | | am | | | | _ | ō |
| | ted | pə, | ø | ۰ ا | | o g |) | Program | | | iew | ram | Checking |
| | nen | neni | PIL | Iten | , | tion of | 5 | о | | | Revi | rog | She |
| | Implementea | Document | Vot WPILIB | Menu Item | | Execution Op Test Routine | 5 | Name VI Name | | | Code I | Test Program | Error (|
| | | | | | | Ď, Ŭ | . , | | Function Prototype | Notes | ပိ | | En |
| RUNGE KUTTA TIME VARYING | X | X | | No | 2 | | \perp | RungeKuttaTimeVarying_RK4_Mat_T_Y.vi | | | <u> </u> | | i |
| | 1 | | | | - 1 | | | | | | (| 1 | |

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

| Revision 2.X 5/2/2022 – ad | dded implicit model follower and time | interpo | olatable i | routines. | | | | - | | | | |
|---|---------------------------------------|-------------------|-----------------------|--|---|------------------|---|--------------------|--|-------------|--------------|----------------|
| | NUMERICAL JACOBIAN | X / Implemented | X | Not WPILIB X X Menu Item | | Test Routine | VI Name NumJacobian_U.vi NumJacobian_X.vi | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| | RICCAT | 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 | | X X Test Routine | Riccati_DARE_N.vi | Function Prototype | Notes Routine exists, it is just a shell Not really done !!! | Code Review | Test Program | Error Checking |
| '====== VISION | | | | | | | | | | | | |
| '====== | COMPUTER VISION UTILITIES | 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 | | Test Routine | VI Name CompVisionUtil_CalculateDistanceToTarget.vi CompVisionUtil_EstimateCameraToTarget.vi CompVisionUtil_EstimateFieldToCamera.vi CompVisionUtil_EstimateFieldToRobot.vi CompVisionUtil_EstimateFieldToRobot_Alt.vi | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| '====== TYPE DEFINITIONS | | | | | | | | | | | | |
| '====================================== | TypeDe | Z Z Z Z Z Z Z Z Z | X X X X X | X X X X X X X X X X | N/A N/A | | VI Name ARM_FF.CTL BANG_BANG.CTL BICOn-Matrix_FUNC_TYPE.CTL CALLBACK_FUNC_TYPE.CTL CHASSIS_SPEEDS.CTL CONTRAINED_STATE.CTL COORDINATE_AXIS.CTL COORDINATE_SYSTEM.CTL DCMOTOR_TYPES_ENUM.CTL | Function Prototype | Notes NOT USED. Should this be deleted or abandoned??? | Code Review | Test Program | Error Checking |

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

| ime interpo | olatab | le rout | ines. | | | |
|-----------------|----------------|---------|-------|------------|--|------------------------------------|
| Z | Χ | Χ | Χ | N/A | DCMOTOR.CTL | |
| Z | Χ | Χ | X | N/A | DCMOTOR_SIM.CTL | |
| Z | Χ | X | X | N/A | DEBOUNCER_TYPE_ENUM.Ctl | |
| Z | Χ | X | X | N/A | DEBOUNCER.CTL | |
| Z | Χ | X | X | N/A | DIFF_DRIVE_ACCEL_LIMIT.CTL | |
| Z | X | X | X | N/A | DIFF_DRIVE_KINEMATICS.CTL | |
| Z | X | X | X | N/A | DIFF_DRIVE_Kitbot_WheelSize_ENUM.ctl | |
| Z | X | X | X | N/A | DiFF_DRIVE_Pose_EST.ctl | |
| Z | X | X | X | N/A | DIFF_DRIVE_ToughBoxMini_GearChoice_ENUM.ctl | |
| Z | X | X | X | N/A | DIFF_DRIVE_ToughBoxMini_MotorChoice_ENUM.ctl | |
| Z | X | X | X | N/A | DIFF_DRIVE_TRAIN_SIM_STATE_ENUM.CTL | |
| Z | X | X | X | N/A | DIFF_DRIVE_TRAIN_SIM.ctl | MARLITH MANDONT VI |
| <u>Z</u> Z | X | X | X | NA NA | DISPLAY_WAYPOINT.ctl DISPLAY_WEIGHTED_WAYPOINT.ctl | Was UTIL_WAYPOINT.VI New V1.5. was |
| | ^ | _ ^ | ^ | /// | DISPERT_WEIGHTED_WATFORMT.CII | UTIL_WEIGHTED_WAYPOINIT.VI |
| | | | | | | OTIE_WEIGHTEB_WATTOURT.VI |
| Z | X | X | X | N/A | ELEV FF.CTL | |
| Z | Χ | Χ | Χ | N/A | ELEVATOR SIM.CTL | |
| Z | Χ | Χ | Χ | N/A | EXTENDED_KALMAN_CORRECT_FUNC_GROUP.CTL | |
| Z | | Χ | Χ | N/A | Extended_kalman_filter.ctl | |
| Z | Χ | Χ | Χ | N/A | FLYWHEEL_SIM.ctl | |
| Z | X | X | X | N/A | FUNCTION_GENERATOR.ctl | |
| Z | X | X | X | N/A | FUNCTION_GENERATOR_MATRIX.ctl | |
| Z | X | X | X | N/A | HOLONOMIC_DRV_CTRL.CTL | New 1/26/21 |
| Z | X | X | X | N/A | TIME_INTERPOLATABLE_BOOLEAN.CTL | |
| Z | Χ | X | X | N/A | TIME_INTERPOLATABLE_DOUBLE.CTL | |
| Z | X | X | X | N/A | TIME_INTERPOLATABLE_POSE2D.CTL | |
| Z | X | X | X | N/A | TIME_INTERPOLATABLE_ROTATION2D.CTL | |
| Z | X | X | X | N/A | KALMAN_FILTER_LATENCY_COMP_FUNC_GROUP.CTL | |
| Z | X | X | X | N/A | KALMAN_FILTER_LATENCY_COMP.CTL | |
| Z | X | X | X | N/A | KALMAN_FILTER.ctl | |
| Z | X | X | X | N/A | LINEAR_FILTER.CTL | |
| Z | X | X | X | N/A | LINEAR_PLANT_INV_FF.ctl | |
| Z | X | X | X | N/A N/A | LINEAR_QUADRATIC_REGULATOR.ctl | |
| Z | X | X | X | N/A | LINEAR_SYSTEM_LOOP.ctl LINEAR SYSTEM SIM.ctl | |
| Z | \overline{X} | X | X | N/A | LINEAR SYSTEM.ctl | |
| Z | | X | X | N/A | LTV DIFF DRIVE CTRL.ctl | |
| Z | | X | X | N/A | LTV DIFF DRIVE CTRL STATE ENUM.ctl | |
| Z | | X | X | N/A | LTV UNICYCLE CONTROLLER.CTL | |
| Z | | X | X | N/A | LTV UNICYCLE CONTROLLER INPUT ENUM.ctl | |
| Z | | X | X | N/A | LTV UNICYCLE CONTROLLER STATE ENUM.ctl | |
| Z | Χ | Χ | Χ | N/A | MECA DRIVE KINEMATICS.CTL | |
| Z | Χ | Χ | Χ | N/A | MECA_DRIVE_ODOMETRY.CTL | |
| Z | | Χ | Χ | 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 | MERWE_SCALED_SIGMA_PTS.ctl | |
| Z | X | X | X | N/A | OBSERVER_SNAP_LIST_ITEM.CTL | |
| Z | X | X | X | N/A | OBSERVER_SNAPSHOT.CTL | |
| Z | X | X | X | N/A | PARAM_STACK_ITEM.CTL | |
| Z | X | X | X | N/A N/A | PARAM_STACK.CTL PID ADV LIMITS.CTL | |
| Z | X | X | X | N/A | PID ADV_LIMITS.CTL PID ADV TUNING.CTL | |
| Z | X | X | X | N/A | PID CONTROLLER.CTL | |
| Z | X | X | X | N/A | PID ERROR TOLERANCE.CTL | |
| Z | X | X | X | N/A | PID INPUT LIMITS.CTL | |
| Z | X | X | X | N/A | PID TUNING.CTL | |
| Z | X | X | X | N/A | POSE2D.CTL | |
| Z | | X | X | N/A | POSE3D.CTL | |
| Z | Х | X | X | N/A | POSEwCURVATURE.CTL | |
| Z | X | X | X | N/A | PROFILED_PID_CONTROLLER.CTL | |
| Z | | X | X | N/A | QUATERNION.CTL | |
| Z | Х | X | X | N/A | RAMSETE_EXE_TUNING.CTL | |
| Z | X | X | Χ | N/A | RAMSETE.CTL | |
| Z | Χ | Χ | Χ | N/A | ROTATION2D.CTL | |
| Z | | Χ | X | N/A | ROTATION3D.CTL | |
| | | | | | | |

FRC_LabVIEW_Trajectory_Library_Routines.xlsx Page 35 / 36

| interpolatable routines. | | | | | | | |
|--------------------------|---|-----|---|-----|---|--|------------------------------------|
| 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 | | |
| Ζ | Χ | Χ | Χ | N/A | TIMER.CTL | | |
| Z | Χ | Χ | X | N/A | TRAJ CONFIG.CTL | | |
| Z | Χ | Χ | X | N/A | TRAJ CONSTRAINT CENTRIPETAL ACCEL.CTL | | |
| Z | Χ | Χ | Χ | N/A | TRAJ CONSTRAINT DIIF DRIVE KINEMATICS.CTL | | |
| Z | Χ | Χ | Χ | N/A | TRAJ CONSTRAINT DIIF DRIVE VOLTAGE.CTL | | |
| ١ | | Χ | | N/A | TRAJ CONSTRAINT JERK.CTL | | Routine exists, it is just a shell |
| Z | Χ | Χ | Χ | N/A | TRAJ CONSTRAINT MECA DRIVE KINEMATICS.CTL | | |
| Z | Χ | Χ | Χ | N/A | TRAJ CONSTRAINT MINMAX.CTL | | |
| Z | Χ | Χ | X | N/A | TRAJ CONSTRAINT SWERVE DRIVE KINEMATICS.CTL | | |
| Z | Χ | Χ | Χ | N/A | TRAJ_STATE.CTL | | |
| Z | Χ | Χ | X | N/A | TRAJECTORY_SPLINE_TYPE_ENUM.CTL | | |
| Z | Χ | Χ | X | N/A | TRAJECTORY.CTL | | |
| Z | Χ | Χ | X | N/A | TRANSFORM2D.CTL | | |
| Z | | Χ | X | N/A | TRANSFORM3D.CTL | | |
| Z | Χ | Χ | Χ | N/A | TRANSLATION2D.CTL | | |
| Z | | Χ | Χ | N/A | TRANSLATION3D.CTL | | |
| Z | Χ | Χ | Χ | N/A | TRAPEZOID_PROFILE_CONSTRAINT.CTL | | |
| Z | X | Χ | X | N/A | TRAPEZOID_PROFILE_STATE.CTL | | |
| Z | Χ | Χ | X | N/A | TRAPEZOID_PROFILE.CTL | | |
| Z | Χ | Χ | X | N/A | TWIST2D.CTL | | |
| Z | | Χ | X | N/A | TWIST3D.CTL | | |
| Z | X | Χ | X | N/A | UNSCENTED_KALMAN_CORRECT_FUNC_GROUP.CTL | | |
| Z | Χ | Χ | X | N/A | UNSCENTED_KALMAN_FILTER.ctl | | |
| Z | Χ | Χ | Χ | N/A | UNSCENTED_KALMAN_NEW_FUNC_GROUP.CTL | | |
| Z | Χ | X | X | N/A | UTIL_PATHFINDER_CONFIG.CTL | | |
| N/A | | N/A | | N/A | WAYPOINTS.CTL | | Delete – obsolete |
| Z | Χ | Χ | Χ | NA | WEIGHTED_WAYPOINT.CTL | | New V1.5 |
| N/A | | N/A | | N/A | X_Y_HEADINGS.CTL | | Delete – obsolete |
| Z | Χ | Χ | Χ | N/A | X_Y_PAIR.CTL | | |

FRC_LabVIEW_Trajectory_Library_Routines.xlsx Page 36 / 36