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...

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

'======== BASE

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| ANALOG DELAY [| X Implemented | X Documented | X Not WPILIB | X Menu Item | - Execution Optimized | Test Routine Sample Program | VI Name AnalogDelay.vi | Function Prototype | Notes Similar to interpolated tree map | Code Review | Test Program | Error Checking |
|---------------------------|-----------------|------------------|----------------|---------------|-----------------------|--------------------------------|---|--------------------|--|-------------|--------------|----------------|
| BUMPLESS TRANSFER [| X Implemented | Documented | X Not WPILIB | X Menu Item | Execution Optimized | Test Routine Sample Program | VI Name BumplessTransfer_Execute.vi | Function Prototype | Notes Similar to interpolated tree map | Code Review | Test Program | Error Checking |
| FUNCTION GENERATOR | X X Implemented | X X X Documented | Not WPILIB | X X Menu Item | 1 | Test Routine Sample Program | | Function Prototype | Notes Similar to interpolated tree map | Code Review | Test Program | Error Checking |
| FUNCTION GENERATOR MATRIX | X X Implemented | X X Documented | X X Not WPILIB | X X Menu Item | Execution Optimized | Test Routine Sample Program | VI Name FunctionGeneratoMatrixr_Add.vi FunctionGenerator_Calculate.vi | Function Prototype | Notes Similar to interpolated tree map Similar to interpolated tree map | Code Review | Test Program | Error Checking |

| ous routines | | | | | | | |
|-----------------|---------------------------------------|---|--------------------|--|-------------|--------------|----------------|
| | X X X X SI | FunctionGenerator_New.vi | | Similar to interpolated tree map | | | |
| LEAD LAG | | VI Name LeadLag Execute.vi | Function Prototype | Notes Similar to interpolated tree map | Code Review | Test Program | Error Checking |
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| LINEAR FILTEI | | We will be set to the set of the | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| | X X X SI | LinearFilter_Calculate.vi | | | | | |
| | X X X X X X X X X X X X X X X X X X X | LinearFilter_CutoffFrequency.vi X LinearFilter_Execute.vi LinearFilter_Factorial.vi LinearFilter_FiniteDifference.vi LinearFilter_HighPass.vi | | Labview style helper AN INTERNAL ROUTINE | | | |
| | X X X X X | LinearFilter_HighPassBW1.vi | | | | | |
| | X X X X X | LinearFilter_HighPassBW2.vi | | | | | |
| | | LinearFilter_LowPassBW1.vi | | | | | |
| | X X X X X | LinearFilter_LowPassBW2.vi | | | | | |
| | X X X X | LinearFilter_MovingAverage.vi | | | | | |
| | X X X I X X X SI | LinearFilter_New.vi LinearFilter Reset.vi | | | | | |
| | X X X SI | LinearFilter_Reset.vi LinearFilter ResetToValue.vi | | | | | |
| | | LinearFilter_Reset i ovalue.vi LinearFilter_SinglePoleIIR.vi | | | | | |
| | X X X X X X X X X X | LinearFilter TimeConst.vi | | | | | |
| MEDIAN FILTEI | | WedianFilter_ResetToValue.vi | Function Prototype | Notes Labview style helper | Code Review | Test Program | Error Checking |
| SLEW RATE FILTE | | VI Name SlewRateLimiter_Calculate.vi SlewRateLimiter_Close.vi X SlewRateLimiter_Execute.vi SlewRateLimiter_GetRate.vi SlewRateLimiter_New.vi SlewRateLimiter_NewInitialZero.vi SlewRateLimiter_Reset.vi SlewRateLimiter_Reset.vi SlewRateLimiter_SetRate.vi | Function Prototype | Notes Labview style helper | Code Review | Test Program | Error Checking |

| 022 – added various routines | | | | | | | | | | | | |
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| | Implemented | Documentec | Not WPILIB | กน | Execution | Test Routine | R VI Name | | | Code Rev | Test Program | |
| | | | ۶ | Menu | | ě | | Function Prototype | Notes | ပိ | , Je | Error |
| TIMER | X | | X | X | | | Timer_Close.vi | | releases semaphore | | | |
| | X | Χ | | X | | | X Timer_Get.vi | | | | | |
| | Χ | | X | X | | | Timer_GetAndReset.vi | | | ļ! | | |
| | X | X | X | | | | Timer_GetInternal.vi | | Internal (private) only | <u> </u> | | |
| | X | X | | X | | | X Timer_HasPeriodPassed.vi | | | ! | | |
| | X | | X | | | | X Timer_HasPeriodPassedOnce.vi | | | <u> </u> | | |
| | X | X | + | X | | | X Timer_New.vi | | | | | |
| | X | X | X | X No | | | X Timer_Reset.vi Timer ResetInternal | | Internal (private) only | | | |
| | X | X | | X | | _ | X Timer_Start.vi | | internal (private) only | | | |
| | X | X | | $\frac{\lambda}{X}$ | | | X Timer_Stop.vi | | | | | |
| | \overline{X} | X | X | | | | Timer_StopInternal.vi | | Internal (private) only | | | |
| | | | | 710 | | | Timor_otopiniomal.vi | | internal (private) only | | | |
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| | 1 | 00 | | | Ě | ě | | Function Prototype | Notes | ပိ | Je Je | Error |
| TIME INTERPOLATABLE BOOLEAN | | X | X | X | 1 | | TimeInterpBoolean_AddSample.vi | | Update to use create matrix | | | |
| | X | X | X | No | 1 | | TimeInterpBoolean_CleanUp.vi | | Update to use create matrix | | | |
| | X | | | X | S | 1 | TimeInterpBoolean_Clear.vi | | | <u> </u> | | |
| | X | X | X | X | 1 | | TimeInterpBoolean_GetSample.vi | | | <u> </u> | | |
| | X | X | X | $\frac{X}{X}$ | S | | TimeInterpBoolean_New.vi TimeInterpBoolean_SetMaxTime.vi | | | <u> </u> | | |
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| | plementec | Documente | Not WPILIB | Menu Item | Th's | # T | R VI Name | | | ě | <i>t</i> | |
| | ш | õ | Vot | <i>Jet</i> | ii. | ies ies | S VI Name | Function Prototype | Notes | Ö | မွ | Error |
| TIME INTERPOLATABLE DOUBLE | X | | | \overline{X} | | | TimeInterpDouble_AddSample.vi | - amount recoype | Update to use create matrix | | | 7 |
| | X | | X | No | | | TimeInterpDouble_CleanUp.vi | | Update to use create matrix | | | |
| | Χ | X | X | X | S | ı | TimeInterpDouble_Clear.vi | | · | 1 | | |
| | Χ | Χ | X | X | 1 | | TimeInterpDouble_GetSample.vi | | | | | |
| | X | X | X | X | S | 1 | TimeInterpDouble_New.vi | | | <u> </u> | | |
| | X | X | X | X | S | <i>I</i> | TimeInterpDouble_SetMaxTime.vi | | | <u></u> ' | | |
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| TIME INTERPOLATABLE POSE2D | X | | <u>≥</u> | | | | 7) VI Name TimeInterpPose2d_AddSample.vi | i unction Frototype | Update to use create matrix | | | |
| TIME INTERN CLATABLE FOSEZO | X | | | No | 1 | | TimeInterpPose2d_Addoannpie.vi TimeInterpPose2d_CleanUp.vi | | Update to use create matrix | | | |
| | X | | X | X | S | , | TimeInterprose2d_Clear.vi | | opado to doo orodio matrix | | | |
| | X | | | $+ \dot{x}$ | 1 | | TimeInterpPose2d_GetSample.vi | | | | | |
| | Χ | Χ | Χ | X | S | I | TimeInterpPose2d_New.vi | | | | | |
| | X | X | X | X | S | 1 | TimeInterpPose2d_SetMaxTime.vi | | | | | |
| | | | | | | | | | | | | |

FRC LabVIEW Trajectory Library - VI Implementation List Revision 2.X 11/06/2022 – added various routines Function Prototype TIME INTERPOLATABLE ROTATION2D $\begin{array}{c|cccc} \hline X & X \\ \hline \end{array}$ TimeInterpRotation2d AddSample.vi Update to use create matrix Χ X No TimeInterpRotation2d_CleanUp.vi Update to use create matrix X X SI TimeInterpRotation2d_Clear.vi X X X X I TimeInterpRotation2d_GetSample.vi TimeInterpRotation2d_New.vi
TimeInterpRotation2d_SetMaxTime.vi X X X X SI X X X X SI Function Prototype VI Name Notes WAIT ADJUST X WaitAdjust.vi Function Prototype Notes DIGITAL SEQUENTIAL LOGIC X DigSeqLogic_Delay.vi X X XX DigSeqLogic_On_Delay.vi DigSeqLogic_Off_Delay.vi DigSeqLogic_One_Shot.vi
DigSeqLogic_SR_Flip_Flop.vi Function Prototype Notes DEBOUNCER $\begin{array}{c|c} X & X \\ \hline X & X \end{array}$ X Debouncer New.vi Debouncer Calculate.vi X X X X Debouncer Execute.vi

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| CONTROLLER |
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ARM FF X X X X X A X A ArmFF_Calculate.vi LabVIEW style single call

XX

XX

No

No

Debouncer_Reset.vi
Debouncer HasElapsed.vi

| ous routines | | | | | | | | | | | | |
|-----------------|----------------------------|------------------|------------|---------------------------------------|---------------------------------------|--|---|---------------------|--|-------------|--------------|----------------|
| | | | X | | | | ArmFF_ExecuteVelocityOnly.vi | | LabVIEW style single call | | | |
| | X | | | X | | | ArmFF_MaxAchieveAccel.vi | | | | | |
| | Χ | | | X | | | ArmFF_MaxAchieveVelocity.vi | | | | | |
| | Χ | X | | X | | | ArmFF_MinAchieveAccel.vi | | | | | |
| | Χ | X | | X | | | ArmFF_MinAchieveVelocity.vi | | | | | |
| | Χ | X | | X | | | ArmFF_New_ZeroGravity.vi | | | | | |
| | Χ | X | | X | | | ArmFF_New.vi | | | | | |
| BANG BANG | X X X X X X | X X X X | | X X X X X X X X X X X X X X X X X X X | 19 19 19 19 19 19 19 19 | DESTRUCTION OF THE PROPERTY OF | VI Name BangBang_AtSetpoint.vi BangBang_Calculate_PV.vi BangBang_Calculate_SP_PV.vi BangBang_Execute.vi BangBang_GetAll.vi BangBang_GetError.vi BangBang_New.vi BangBang_SetSetpoint.vi | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| | Χ | X | | X | SI | | BangBang_SetTolerance.vi | | | | | |
| CONTROLLER UTIL | X Implemented | X Documented | Not WPILIB | X Menu Item | © Execution Optimized | | VI Name ControllerUtil_GetModulusError.vi | Function Prototype | Notes This was short lived in WPILIB, but still useful here. | Code Review | Test Program | Error Checking |
| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | פאן אסמוווש | Sample Program | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| ELEV FF | _ <u>=</u> | X | _ < | X | <u> </u> | ` | ElevFF_Calculate.vi | r unction Prototype | Notes | | | Щ |
| | X | X | | $\frac{x}{x}$ | | | ElevFF CalculateVelocityOnly.vi | | | | | |
| | | | X | + ^ + | | + | ElevFF_Execute.vi | | LabVIEW style single call | | | |
| | | | X | + + | | + | ElevFF_ExecuteVelocityOnly.vi | | LabVIEW style single call | | | |
| | Χ | X | | X | | | ElevFF MaxAchieveAccel.vi | | | | | |
| | X | X | | X | | | ElevFF MaxAchieveVelocity.vi | | | | | |
| | X | X | | X | | | ElevFF_MinAchieveAccel.vi | | | | | |
| | Χ | X | | X | | | ElevFF_MinAchieveVelocity.vi | | | | | |
| | X | X | | X | | | ElevFF_New_ZeroAccel.vi | | | | | |
| | X | X | | X | timized | | ElevFF_New.vi | | | | | б |
| | Implemented | Documented | Not WPILIB | Menu Item | Execution Opt | ן פאן אסמווויפ | Sample Program | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| HOL_DRV_CTRL | | | | X | | | HolDrvCtrl_AdvCalculate_Trajectory.vi | | Added 1/24/2022 | | | |
| | X | X | X | X | | | HolDrvCtrl_AdvCalculate.vi | | Added 1/24/2022 | | | |
| | X | X | | X | SI | | HolDrvCtrl_AtReference.vi | | Added 1/26/21 | | | |
| | X X X | Χ | | X X X | 1 | | HolDrvCtrl_Calculate_Trajectory.vi HolDrvCtrl_Calculate.vi HolDrvCtrl_Execute_Trajectory.vi | | Added 1/26/21 Added 1/26/21 Added 1/24/2022 | | | |
| Ļ | ^ | _ ^ | _ ^ | _ ^ | | | TOID TYOUI_EXECUTE_TTAJECTORY.VI | | 7412022 | | | |

| outines | | | | | | | | | | | |
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| | X | Χ | Χ | X | | | HolDrvCtrl_Execute.vi | | Future | | |
| | X | X | | X | SI | | HolDrvCtrl New.vi | | Added 1/26/21 | | |
| | X | Χ | Χ | Χ | SI | | HolDrvCtrl PackExecuteSP.vi | | | | |
| | X | X | X | X | <u> </u> | | HolDrvCtrl PackPID.vi | | Added 1/24/2022 | | |
| | | ^ | | | | | | | | | |
| | Χ | Χ | Χ | Χ | | | HolDrvCtrl_PackProfPID.vi | | Added 1/24/2022 | | |
| | X | Χ | | X | SI | | HolDrvCtrl_SetEnabled.vi | | Added 1/26/21 | | |
| | X | X | | X | SI | | HolDrvCtrl SetTolerance.vi | | Added 1/26/21 | | |
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| PID AUTOTUNE | X Implemented | Documented | X Not WPILIB | S Menu Item | Execution Optimize | Test Routine Sample Program | VI Name PIDAutoTune_ClosedLoopStep.vi | Function Prototype | Notes | Code Review Test Program | Error Checking |
| | X | | Χ | No | | | PIDAutoTune_Convert_Academic_To_NonInteracting.vi | | | | |
| | X | | Χ | No | | | PIDAutoTune_OpenLoopStep.vi | | | | |
| | X | | Χ | X | | | PIDAutoTune SetTuningArguments.vi | | | | |
| | X | | X | X | | | PIDAutoTune Step.vi | | | | |
| | | | | , | | | 127 tato 1 ano_otop.vi | | | | |
| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimizea | Test Routine Sample Program | VI Name | Function Prototype | Notes | Code Review Test Program | Error Checking |
| PID CONTROLLER | | \overline{X} | \overline{x} | \overline{x} | _ | | PIDController AdvCalculate FF Sp Pv Per.vi | | Advanced PID | | |
| TID GOMMOLLEN | X | X | X | X | | X | PIDController_AdvCalculate_FF_Sp_Pv.vi PIDController_AdvExecute.vi | | Advanced PID Labview style helper. Advanced PID | | |
| | X | Χ | | X | SI | | PIDController AtSetpoint.vi | | | | |
| | | X | | X | | | PIDController Calculate PV.vi | | | | |
| | X | | | | | | | | | | |
| | X | Χ | | Χ | | | PIDController_Calculate_SP_PV.vi | | | | |
| | X | Χ | | X | SI | | PIDController_DisableContinousInput.vi | | | | |
| | X | Χ | | Χ | SI | | PIDController EnableContinousInput.vi | | | | |
| | X | X | Χ | X | | Y | PIDController Execute.vi | | Labview style helper | | |
| | | ^ | ^ | ^ | | Х | PIDController GetContinuousError.vi | | OBSOLETE – Removed | | |
| | | | | | | | | | OBSOLETE - Removed | | |
| | X | Χ | | X | SI | | PIDController_GetPeriod.vi | | | | |
| | X | X | | X | SI | | PIDController GetPID.vi | | | | |
| | X | Χ | | Χ | SI | | PIDController GetPositionError.vi | | | | |
| | X | X | | X | SI | | PIDController GetSetpoint.vi | | | | |
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| | X | X | | | SI | | PIDController_GetTolerance.vi | | | | |
| | Χ | Χ | | Χ | SI | | PIDController_GetVelocityError.vi | | | | |
| | X | Χ | | Χ | SI | | PIDController_IsContinuousInputEnabled.vi | | | | |
| | X | Χ | | Χ | 1 | | PIDController New.vi | | | | |
| | X | Χ | | X | 1 | | PIDController NewPeriod.vi | | | | |
| | X | X | X | \hat{x} | SI | | PIDController Pack AdvLimits.vi | | | | |
| | | | | | | | | | | | |
| | X | Χ | | Χ | SI | | PIDController_Pack_AdvTuning.vi | | | | |
| | X | Χ | | Χ | SI | | PIDController_Pack_ErrorTolerance.vi | | | | |
| | X | Χ | Χ | Χ | SI | | PIDController_Pack_InputLimits.vi | | | | |
| | X | Χ | | X | SI | | PIDController_Pack_Tuning.vi | | | | |
| | X | X | | X | SI | | PIDController Reset.vi | | | | |
| | | X | | | | | PIDController SetD.vi | | | | |
| | X | | ., | X | SI | | | | 1818 | | |
| | X | Χ | | Χ | SI | | PIDController_SetDerivativeFilter.vi | | Advanced PID | | |
| | X | Χ | X | No | | | PIDController_SetFeedForward_OBSOLETE_DELETE.vi | | Advanced PID, Obsolete – DELETE | | |
| | X | Х | X | No | | | PIDController_SetFFGain_OBSOLETE_DELETE.vi | | Advanced PID, Obsolete – DELETE | | |
| | X | Y | | Х | ÇI. | | PIDController Setl.vi | | | | |
| | ^ | ^ | | ^ | IJΙ | | | | ODDOLETE D | | |
| | | | | | | | PIDController_SetInputRange.vi | | OBSOLETE – Removed | | |
| | 1 1/ | \ <u>/</u> | | X | SI | | PIDController_SetIntegratorRange.vi | | | | |
| | X | Χ | ! | | | | | | | | |
| | X | | X | | | | | | Advanced PID | | |
| | X | Χ | X | Χ | SI | | PIDController_SetOutputLimits.vi | | Advanced PID | | |
| | X | X | | X X | SI SI | | PIDController_SetOutputLimits.vi PIDController_SetP.vi | | Advanced PID | | |
| | X | Χ | | Χ | SI | | PIDController_SetOutputLimits.vi | | Advanced PID | | |

| Ided various routines | | | | | | | - | | | | |
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| | X | (X | X | SI | | PIDController_SetPIDF.vi | | Advanced PID | | | |
| | X | (| X | SI | | PIDController_SetSetpoint.vi | | | | | |
| | X | | X | SI | | PIDController_SetTolerance.vi | | | | | |
| | X | (| X | SI | | PIDController_SetTolerancePandV.vi | | | | | |
| PROFILED PID CONTROLLER | Implemented | Not WPILIB | n Item | 9 9 Execution Optimized | Test Routine | ram | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| | X | | $\frac{\lambda}{X}$ | | | ProfiledPIDController DisableContInput.vi | | | | | |
| | $\begin{array}{c c} X & Z \\ \hline X & Z \end{array}$ | | $\frac{\lambda}{X}$ | | | ProfiledPIDController EnableContInput.vi | | | | | |
| | X X | | | | | ProfiledPIDController_Execute.vi | | Single call LabVIEW style function. | | | |
| | X | (| X | SI | | ProfiledPIDController_GetGoal.vi | | | | | |
| | X | | X | | | ProfiledPIDController_GetPeriod.vi | | | | | |
| | | (X | | | | ProfiledPIDController GetPID.vi | | WPILIB has separate getters. | | | |
| | X | (| X | | | ProfiledPIDController GetPositionError.vi | | | | | |
| | X | (| X | | | ProfiledPIDController_GetSetpoint.vi | | | | | |
| | X | (| | SI | | ProfiledPIDController GetTolerance.vi | | | | | |
| | X | | X | | | ProfiledPIDController GetVelocityError.vi | | | | | |
| | X | | X | | | ProfiledPIDController New.vi | | | | | |
| | X | | X | | | ProfiledPIDController NewPeriod.vi | | | | | |
| | X | | X | | | ProfiledPIDController Reset PosOnly.vi | | | | | |
| | X | | $\frac{X}{X}$ | | | ProfiledPIDController Reset PosVel.vi | | | | | |
| | X | | X | | | ProfiledPIDController Reset.vi | | | | | |
| | X | | $\frac{\lambda}{X}$ | | | ProfiledPIDController SetConstraints.vi | | | | | |
| | $\begin{array}{c c} X & Z \\ \hline X & Z \end{array}$ | | $\frac{\lambda}{X}$ | | | ProfiledPIDController SetGoal PosOnly.vi | | | | | |
| | $\begin{array}{ c c c c c c c c c c c c c c c c c c c$ | | $\frac{\lambda}{X}$ | | | ProfiledPIDController SetGoal.vi | | | | | |
| | | | | | | ProfiledPIDController_SetGoal.vi | | | | | |
| | X | | X | | | | | | | | |
| | X | | X | | | ProfiledPIDController_SetPID.vi | | | | | |
| | X | | X | | | ProfiledPIDController_SetTolerance_PosOnly.vi | | | | | |
| | X | (| X | SI | | ProfiledPIDController_SetTolerance_PosVel.vi | | | | | |
| | Implemented | | Mer | | Test Routine | | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| RAMSETE | | | X | | | Ramsete_AtReference.vi | AtReference | | | | |
| | X | | X | X | | Ramsete_Calculate_Trajectory.vi | calculate_trajectory | | | | |
| | X | | X | X | | Ramsete_Calculate.vi | calculate | | | | |
| | X | | X | X | | Ramsete_Diff_DO_Eng.vi | | | | | |
| | X | (X | | X | | Ramsete_Diff_DO_SI.vi | | | | | |
| | X | | | | | Ramsete_Execute_ENG.vi | Use this one!! | | | | |
| | X | | | | | Ramsete_Execute_PackTuning_ENG.vi | | | | | |
| | X | | | | | Ramsete_Execute_PackTuning.vi | | | | | |
| | X | | | | | Ramsete_Execute.vi | | | | | |
| | X | | X | SI | | Ramsete_New_B_Z.vi | new(b, zeta) | | | | |
| | X | | X | SI | | Ramsete_New.vi | new | | | | |
| | X | | X | SI | | Ramsete_SetEnabled.vi | SetEnabled | | | | |
| | X | | X | SI | | Ramsete_SetTolerance.vi | SetTolerance | | | | |
| | X | | X | X | | Ramsete_SINC.vi | sinc | internal | | | |
| | | | | | | | | | | | |

FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 11/06/2022 – added various routines Execution Optimized Routine Not WPILIB Menu Item Function Prototype Notes SIMPLE MOTOR FEEDFORWARD $X \mid X$ SimpleMotorFF Calculate CalcAccel.vi X SimpleMotorFF Calculate NextV Dt.vi Χ X X X X SI SimpleMotorFF Calculate.vi public double calculate(double velocity, double acceleration) SimpleMotorFF_CalculateVelocityOnly.vi X X X SI public double calculate(double velocity) X X Χ SimpleMotorFF MaxAchieveAccel.vi public double maxAchievableAcceleration(double maxVoltage, double velocity) Χ X Χ SimpleMotorFF MaxAchieveVel.vi public double maxAchievableVelocity(double maxVoltage, double X X X SimpleMotorFF MinAchieveAccel.vi public double minAchievableAcceleration(double maxVoltage, double velocity) Χ Χ SimpleMotorFF_MinAchieveVel.vi X public double minAchievableVelocity(double maxVoltage, double acceleration)
public SimpleMotorFeedforward(double ks, double kv, double ka) SimpleMotorFF New.vi Χ SI X public SimpleMotorFeedforward(double ks, double kv) '======== **GEOMETRY** '======== Routine VI Name Function Prototype Notes COORDINATE AXIS X CoordAxis D.vi X X SI SI CoordAxis_E.vi X Χ X X X SI CoordAxis N.vi X Χ SI CoordAxis New.vi Χ X SI X CoordAxis S.vi Χ Χ X SI CoordAxis U.vi XX X SI CoordAxis W.vi Function Prototype Notes COORDINATE SYSTEM XX Χ SI CoordSystem Convert Pose3d.vi CoordSystem Convert Rotation3d.vi XX X SI XX X SI CoordSystem_Convert_Translation3d.vi X SI CoordSystem_Convert_Transform3d.vi X X Χ SI X CoordSystem_EDN.vi Χ Χ X SI X CoordSystem_NED.vi X X Χ X SI X CoordSystem New.vi X SI X CoordSystem NWU.vi X Execution Optir Function Prototype Notes

boolean equals(other obj)

rotation2d getRotation()

pose2d exp(twist2d twist)

POSE2D

XX

XX

XX

X SI

XX

X SI

Pose2d_Equals.VI

Pose2d getRotation.vi

Pose2d Exp.vi

can also use cluster unpack

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|-------------------------|---------------------------|----------------|--------------|-----------|-----------|--------------|----------|----------------------------------|--|-----------------------------|--------|----------|----------|
| outines | | | | | | | | | | | | | |
| | X X | | | Χ | SI | | | Pose2d_getTranslation.vi | translation2d getTranslation() | can also use cluster unpack | | | |
| | XX |) | (| Χ | SI | | | Pose2d_getXY.vi | | | | | |
| | XX |) | (| X | SI | | | Pose2d_getXYAngle.vi | | | | | |
| | XX | | | X | 1 | | | Pose2d_Interpolate.vi | | | | | |
| | XX | | | X | Χ | | | Pose2d_Log.vi | twist2d log(pose2d end) | | | | |
| | XX | | | X | SI | | | Pose2d Minus.vi | transform2d minus(pose2d other) | | | | |
| | XX | | | \hat{X} | SI | | | Pose2d New TRRO.vi | pose2d new(translation2d, rotation2d) | | | | |
| | | | _ | | | | | | | | | | |
| | X X | | | X | SI | | | Pose2d_New.vi | pose2d new(double x, double y, rotation2d) | | | | |
| | X X | | _ | X | SI | | _ | Pose2d_Plus.vi | pose2d plus(transform2d other) | | | | |
| | XX | | | Χ | SI | | | Pose2d_RelativeTo.vi | pose2d relativeto(pose2d other) | | | | |
| | X X | | | Χ | SI | | | Pose2d_TransformBy.vi | pose2d transformby(transform2d other) | | | | |
| | | | | | | | | | pose2d new() | can use cluster constant | | | |
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| | ~ ~ | | | | Optin | 4. | Program | | | | > | E | Checking |
| | Implementec Documentea | g | ۵ | _ | 0 | Test Routine | õ | | | | je. | Progran | K |
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| | 700 | מו וומ/או לכוא | - | Menu Item | Execution | st | Sample | | | | Code | st | Error |
| | E G | 2 | 2 | ž | Ψ | 1 e | Sa | VI Name | Function Prototype | Notes | Ö | <u>1</u> | Ē |
| POSE3D | $X \mid X$ | | | X | SI | | | Pose3d_Equals.VI | | | | | |
| | X X | | | Χ | Χ | | | Pose3d_Exp.vi | | | | | |
| | XX | | | X | SI | | | Pose3d_getRotation.vi | | | | | |
| | XX | | | X | SI | | | Pose3d_getTranslation.vi | | | | | |
| | XX | | | X | SI | | | Pose3d_getXYZ.vi | | | | | |
| | XX | | | X | 1 | | | Pose3d_Interpolate.vi | | | | | |
| | XX | | | X | X | | | Pose3d_Log.vi | | | | | |
| | XX | | | X | SI | | | Pose3d Minus.vi | | | | | |
| | XX | | _ | \hat{x} | SI | | | Pose3d New.vi | | | | | |
| | XX | | | \hat{x} | SI | | | Pose3d New Default.vi | | | | | |
| | <i>X X</i> | | | ^ | SI | | | Pose3d New Pose2d.vi | | | | | |
| | | | | V | SI | | | | | | | | |
| | | | | X | | | | Pose3d_New_Trans3dRot3d.vi | | | | | |
| | X X | | | X | SI | | | Pose3d_Plus.vi | | | | | |
| | XX | | | X | SI | | | Pose3d_RelativeTo.vi | | | | | |
| | X X | | | No | SI | | | Pose3d_RotationVectorToMatrix.vi | | | | | |
| | XX | | | X | SI | | | Pose3d_ToPose2d.vi | | | | | |
| | X X | | _ | X | SI | | | Pose3d_TransformBy.vi | | | | | |
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| | nu eu | Š | 3 | 2 | Σ | Œ | ď | • | | | | <u>a</u> | Ź |
| | Implement | 11Q/VI +O/V | 3 | Menu Item | Execution | Test | an | VI Name | Francisco Brookston | Nister | Code | est | Error |
| OUATERNION | E 0 | | | ~ | | | ှ | VI Name | Function Prototype | Notes | | <u> </u> | |
| QUATERNION | XX | | | X | SI | | | Quaternion_Equals.vi | | | | | |
| | X X | | | X | SI | | | Quaternion_Get_All.vi | | | | | |
| | X X | | | X | SI | | | Quaternion_Get_LVQuat.vi | | | | | |
| | X X | | | X | SI | | | Quaternion_Get_Vect.vi | | | | | |
| | X X | | | X | SI | | | Quaternion_Get_W.vi | | | | | |
| | XX | | | Χ | SI | | | Quaternion_Inverse.vi | | | | | |
| | X X | | | Χ | SI | | | Quaternion_New.vi | | | | | |
| | X X | | | Χ | SI | | | Quaternion_New_Default.vi | | | | | |
| | X X | | | Χ | SI | | | Quaternion_New_LVQuat.vi | | | | _ | |
| | XX | | | Χ | SI | | | Quaternion_Normalize.vi | | | | | |
| | XX | | | Χ | SI | | | Quaternion_Plus.vi | | | | | |
| | XX | | | Χ | SI | | | Quaternion_Times.vi | | | | | |
| | XX | | | X | SI | | | Quaternion_ToRotationVector.vi | | | | | |
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| routines | | | | | | | | | _ | | | | |
|-------------|-----------------|---------------------------------------|--------------|---------------|-------------------------|--------------|----------------|---|--|--|-------------|--------------|----------------|
| ROTATION2D | < X Implemented | X X Documented | Not WPILIB | X X Menu Item | 일 일 Execution Optimized | Test Routine | Sample Program | VI Name Rotation2d_CreateAngle.vi Rotation2d_CreateAngleDegrees.vi | Function Prototype rotation2d new(double value) rotation2d fromDegrees(double degrees) | Notes | Code Review | Test Program | Error Checking |
| | X | X | | X | SI | | | Rotation2d_CreateAngleDegrees.vi Rotation2d_CreateAngleRotations.vi | rotation2d fromDegrees(double degrees) | convert to radians then create | | | |
| | X | X | | X | SI | | | Rotation2d CreateXY.vi | rotation2d new(double x, double y) | | | | |
| | Χ | Χ | | Χ | SI | | | Rotation2d_Equals.vi | boolean equals(rotation2d other) | | | | |
| | X | Χ | Χ | X | SI | | | Rotation2d_GetAngleCosSin.vi | | New 1/26/21 | | | |
| | X | X | | X | SI SI | | | Rotation2d_GetCos.VI Rotation2d_GetDegrees.VI | double getCos() double getDegrees() | use cluster unpack use cluster unpack, then convert to | | | |
| | ^ | ^ | | ^ | SI | | | Rotationzu_GetDegrees.vi | double getDegrees() | degree | | | |
| | Χ | Χ | | Χ | SI | | | Rotation2d_GetRadians.VI | double getRadians() | use cluster unpack | | | |
| | X | X | | X | SI SI | | | Rotation2d_GetRotations.vi Rotation2d GetSin.VI | double getSin() | use cluster unpack | | | |
| | X | X | | X | SI | | | Rotation2d_GetSin.VI Rotation2d_GetTan.VI | double getSin() double getTan() | can calculate | | | |
| | X | X | | X | SI | | | Rotation2d_Interpolate.vi | assati gen an () | Sur Sursurus | | | |
| | Χ | Χ | | Χ | SI | | | Rotation2d_Minus.vi | rotation2d minus(rotation2d other) | | | | |
| | X | X | | X | SI | | | Rotation2d_Plus.vi | rotation2d plus(rotation2d other) | | | | |
| | X | X | | X | SI SI | | | Rotation2d_RotateBy.vi Rotation2d_Times.vi | rotation2d rotateby(rotation2d other) rotation2d times(double scalar) | | | | |
| | X | X | | X | SI | | | Rotation2d_UnaryMinus.vi | rotation2d unaryminus() | | | | |
| | | | | | | | | | rotation2d new() | can use cluster constant | | | |
| ROTATION3D | | X X X X X X X X X X X X X X X X X X X | X Not WPILIB | Wenu Items | | Test Routine | Sample Program | VI Name Rotation3d_ Create_ AxisAngle.vi Rotation3d_ Create_ Default.vi Rotation3d_ Create_ Quaternion.vi Rotation3d_ Create_ InitialFinalVector.vi Rotation3d_ Create_ RollPitchYaw.vi Rotation3d_ Create_ RotMatrix.vi Rotation3d_ Equals.vi Rotation3d_ GetAxisAngle.vi Rotation3d_ GetQuaternion.vi Rotation3d_ GetXYZ.vi Rotation3d_ Interpolate.vi Rotation3d_ Minus.vi Rotation3d_ Plus.vi Rotation3d_ RotateBy.vi Rotation3d_ ToRotation2d.vi Rotation3d_ UnaryMinus.vi | Function Prototype | Notes | Code Reviev | Test Progra | Error Checking |
| | | | | | | | | | | | | | |
| | ted | pə, | 9 | | Optimized | ine | rogram | | | | iew | ram | cking |
| TRANSFORM2D | Χ | X X Documented | Not WPILIB | X X Menu Item | ଦ୍ର ଦ୍ର Execution | Test Routine | Sample Program | Transform2d_Create_PosePose.vi Transform2d_Create_TransRot.vi | Function Prototype transform2d new(pose2d, pose2d) transform2d new(translation2d, rotation2d) | Notes | Code Review | Test Program | Error Checking |
| TRANSFORM2D | X X X | X X X | Not WPILIB | X X X | ଦ୍ର ଦ୍ର Execution | Test Routine | Sample Program | Transform2d_Create_PosePose.vi Transform2d_Create_TransRot.vi Transform2d_Equals.VI | transform2d new(pose2d, pose2d) transform2d new(translation2d, rotation2d) boolean equals(other transform2d) | | Code Review | Test Program | Error Checking |
| TRANSFORM2D | X | X | Not WPILIB | X | ଦ୍ର ଦ୍ର Execution | Test Routine | Sample Program | Transform2d_Create_PosePose.vi Transform2d_Create_TransRot.vi | transform2d new(pose2d, pose2d) transform2d new(translation2d, rotation2d) | Notes use cluster unpack use cluster unpack | Code Review | Test Program | Error Checking |

| is routines | | | | | | | | | | | | | |
|----------------|-----------------------|----------------------------|------------|----------------------------|-----------------------|--------------|--------------|---|--|--------------------------|-------------|--------------|----------------|
| | X | Χ | Χ | Χ | SI | | | Transform2d_GetXY.vi | | | | | |
| | X | Χ | Χ | Χ | SI | | | Transform2d_GetXYAngle.vi | | | | | |
| | X | Χ | | Χ | SI | | | Transform2d_Inverse.vi | transform inverse() | new | | | |
| | X | Χ | | Χ | Si | | | Transform2d_Plus.vi | | | | | |
| | X | Χ | | Χ | SI | | | Transform2d_Times.vi | transform2d times(double scalar) | | | | |
| | | | | | | | | | transform2d new() | can use cluster constant | | | |
| | | | | | | | | | | | | · | |
| TRANSFORM3D | X Implemented | X Documented | Not WPILIB | X Menu Item | ত Execution Optimized | Test Routine | | VI Name Transform3d_Create_Default.vi | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| | X | Χ | | Χ | SI | | | Transform3d_Create_Pose3dPose.3dvi | | | | | |
| | X | Χ | | Χ | SI | | | Transform3d Create Trans3dRot3d.vi | | | | | |
| | X | Χ | | X | SI | | | Transform3d Equals.VI | | | | | |
| | X | Χ | | Χ | SI | | | Transform3d GetRotation3d.VI | | | | | |
| | X | Χ | | Χ | SI | | | Transform3d GetTranslation3d.VI | | | | | |
| | X | Χ | X | X | SI | | | Transform3d GetXYZ.vi | | | | | |
| | X | X | | X | | | | Transform3d Inverse.vi | | | | | |
| | X | X | | X | Si | | | Transform3d Plus.vi | | | | | |
| | X | X | | X | SI | | | Transform3d Times.vi | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| TRANSLATION2D | X | Χ | | Χ | SI | | | Translation2d_Create_DistAng.vi | | | | | |
| | X | Χ | | Χ | SI | | | Translation2d_Create.vi | translation2d new(double x, double y) | | | | |
| | X | Χ | | Χ | SI | | | Translation2d_Equals.vi | boolean equals(translation other) | | | | |
| | X | Χ | | Χ | SI | | | Translation2d_GetAngle.vi | | | | | |
| | X | Χ | | Χ | SI | | | Translation2d GetDistance.vi | double getDistance(translation2d other) | | | | |
| | X | Χ | | Χ | SI | | | Translation2d GetNorm.VI | double getNorm() | can use cluster unpack | | | |
| | X | Χ | | Χ | SI | | | Translation2d GetX.VI | double getX() | can use cluster unpack | | | |
| | X | Χ | Χ | Χ | SI | | | Translation2d GetXY.VI | S (/ | · | | | |
| | X | Χ | | Х | SI | | | Translation2d GetY.VI | double getY() | can use cluster unpack | | | |
| | X | X | | X | SI | | | Translation2d Interpolate.vi | January 3-11 () | | | | |
| | X | | | X | | | | Translation2d_Minus.vi | translation2d minus(translation2d other) | | | | |
| | X | X | | X | SI | | | Translation2d Plus.vi | translation2d plus(translation2d other) | | | | |
| | X | | | X | | | | Translation2d_RotateBy.vi | translation2d rotateBy(rotation2d other) | | | | |
| | X | X | | X | SI | | | Translation2d Times.vi | translation2d times(double scalar) | | | | |
| | X | X | | X | SI. | | | Translation2d UnaryMinus.vi | translation2d unaryminus() | | | | |
| | , | | | ,, | | | | - Carloidae - Lag-orial y minasiri | translation2d new() | can use cluster constant | | | |
| | | | | | | | | | translation2d div(double scalar) | can multiply by 1/scalar | | | |
| | | | | | Optimized | | ат | | | | | E | ecking |
| | lemented | cumented | WPILIB | nu Item | cution Op | t Routine | nple Progra | | | | de Reviev | st Progran | or Che |
| | mplemented | Oocumented | Vot WPILIB | Vlenu Item | Execution Op | Test Routine | Sample Progr | VI Name | Function Prototype | Notes | Sode Reviev | Test Progra | Error Che |
| TRANSI ATIONAD | × Implemented | X Documented | Not WPILIB | × Menu Item | Execution | Test Routine | | VI Name | Function Prototype | Notes | Code Review | Test Progra | Error Checking |
| TRANSLATION3D | X | Χ | Not WPILIB | X | © Execution | Test Routine | | Translation3d_Create.vi | Function Prototype | Notes | Code Reviev | Test Progra | Error Che |
| TRANSLATION3D | X | X | Not WPILIB | X | S S Execution | Test Routine | - | Translation3d_Create.vi Translation3d_Create_Default.vi | Function Prototype | Notes | Code Reviev | Test Progra | Error Che |
| TRANSLATION3D | X X X | X X X | Not WPILIB | X X X | S S Execution | Test Routine | | Translation3d_Create.vi Translation3d_Create_Default.vi Translation3d_Create_DistAng.vi | Function Prototype | Notes | Code Reviev | Test Progra | Error Ch |
| TRANSLATION3D | X X X X | X X X | Not WPILIB | X X X | S S Execution | Test Routine | | Translation3d_Create.vi Translation3d_Create_Default.vi Translation3d_Create_DistAng.vi Translation3d_Div.vi | Function Prototype | Notes | Code Reviev | Test Progra | Error Ch |
| TRANSLATION3D | X X X X | X X X X | Not WPILIB | X X X X | S S Execution | Test Routine | | Translation3d_Create.vi Translation3d_Create_Default.vi Translation3d_Create_DistAng.vi Translation3d_Div.vi Translation3d_Equals.vi | Function Prototype | Notes | Code Reviev | Test Progra | Error Ch |
| TRANSLATION3D | X X X X X | X X X X X | Not WPILIB | X X X X X | IS IS Execution | Test Routine | | Translation3d_Create.vi Translation3d_Create_Default.vi Translation3d_Create_DistAng.vi Translation3d_Div.vi Translation3d_Equals.vi Translation3d_GetDistance.vi | Function Prototype | Notes | Code Reviev | Test Progra | Error Ch |
| TRANSLATION3D | X X X X | X X X X X X | | X X X X X X | IS IS Execution | Test Routine | | Translation3d_Create.vi Translation3d_Create_Default.vi Translation3d_Create_DistAng.vi Translation3d_Div.vi Translation3d_Equals.vi | Function Prototype | Notes | Code Reviev | Test Progra | Error Ch |

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| | | | | | | | | | | |
| X | X | | X | SI | | Translation3d_Interpolate.vi | | | | |
| X | X | | X | SI | | Translation3d_Minus.vi | | | | |
| X | Χ | | X | SI | | Translation3d_Plus.vi | | | | |
| X | Χ | | X | SI | | Translation3d_RotateBy.vi | | | | |
| X | Χ | | X | SI | | Translation3d Times.vi | | | | |
| X | Χ | | X | SI | | Translation3d_ToTranslation2d.vi Translation3d_UnaryMinus.vi | | | | |
| X | Χ | | X | SI | | Translation3d_UnaryMinus.vi | | | | |
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|---------|-------------|------------|------------|-----------|----------------|--------------|-------------------|-----------------------------|-------|-------------|--------------|----------------|
| TWIST2D | X | X | | X | SI | | Twist2d_Create.vi | twist new(x, y, theta) | | | | |
| | X | X | | X | SI | | Twist2d_Equals.VI | boolean equals(obj other) | | | | |
| | X | X | X | X | SI | | Twist2d_GetAll.VI | | | | | |

| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | Function Prototype | Notes | Code Review | Test Program | Error Checking |
|---------|-------------|------------|------------|-----------|---------------------|--------------|-------------------|--------------------|-------|-------------|--------------|----------------|
| TWIST3D | X | X | | X | SI | X | Twist3d_Create.vi | | | | | |
| | Χ | X | | X | SI | X | Twist3d_Equals.VI | | | | | |
| | Χ | X | X | X | SI | X | Twist3d GetAll.VI | | | | | |

'======== Function Prototype Notes CHASSIS SPEEDS X ChassisSpeeds_FromFieldRelativeChassisSpeeds.VI X SI ChassisSpeeds_FromFieldRelativeSpeeds.VI chassisspeeds fromFieldRelativeSpeeds(double x, double y,

ChassisSPeeds_GetXYOmega.vi

ChassisSpeeds_New.vi

| Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
|-----------------------------------|------------|------------|-----------|---------------------|--------------|----------------|----------------------------------|--|-------|-------------|--------------|----------------|
| DIFFERENTIAL DRIVE KINEMATICS X | X | | X | 1 | X | | DiffKinematics_New.vi | diffDriveKine new(double trackWidth) | | | | |
| X | X | | Χ | Χ | Χ | | DiffKinematics_toChassisSpeed.vi | chassisSpeeds toChassisSpeeds(diffDrWheelSpeeds) | | | | |
| X | X | | Χ | SI | Χ | | DiffKinematics_toWheelSpeed.vi | diffDriveWheelSpeed toWheelSpeeds(chassisSpeeds) | | | | |

Not WPILIB Menu Item Function Prototype Notes

double angvel, rotation2d robotangle)

chassisspeeds new ()

chassisspeeds new (double xvel, double yvel, double angvel)

can use cluster constant

'======== KINEMATICS

FRC LabVIEW Trajectory Library – VI Implementation List Revision 2.X 11/06/2022 – added various routines DIFFERENTIAL DRIVE ODOMETRY DiffOdometry Execute.vi DONT NEED Χ Χ DiffOdometry_Update.vi pose2d update(rotation2d gyro, double leftdist, double right dist) Incorporates enhanced reset diffDrOdom new(rotation gyro, pose initial) diffDrOdom new(rotation gyro) void resetPosition(pose2d, rotation2d) incorporated into "update" pose2d getPoseMeters() Function Prototype VI Name Notes DIFFERENTIAL DRIVE WHEEL SPEEDS diffDrWheelSpeeds new() diffDrWheelSpeeds new(double leftVel, double rightVel) XX XX DiffWheel Normalize.vi void normalize(double maxVel) Function Prototype Notes MECANUM DRIVE KINEMATICS X X Χ MecaKinematics New.vi Χ MecaKinematics SetInverseKinematics.vi Χ X X X MecaKinematics_ToChassisSpeeds.vi X XX Χ MecaKinematics_ToWheelSpeeds.vi XX Χ MecaKinematics ToWheelSpeedsZeroCenter.vi Jenu Item Notes VI Name Function Prototype MECANUM DRIVE MOTOR VOLTAGE nothing done Function Prototype Notes MECANUM DRIVE ODOMETRY MecaOdometry Execute.vi Χ Χ MecaOdometry GetKinematics.vi X X Χ MecaOdometry GetPose.vi X X Χ MecaOdometry New.vi XX Χ MecaOdometry_NewDefaultPose.vi XX X MecaOdometry Reset.VI XX X MecaOdometry Update.vi XX MecaOdometry_UpdateWithTime.vi Χ

| 2 – added various routines | | | | | | | | | | · | | | |
|----------------------------|---------------------------------------|---------------------|------------|---------------|-----------------------|--------------|----------------|---|---|--|-------------|--------------|----------------|
| MECANUM DRIVE WHEEL SPEEDS | Χ | X | | X | SI | | | MecaWheel_New.Vi | public MecanumDriveWheelSpeeds(double | | | | |
| | | | | | | | | _ | frontLeftMetersPerSecond, double frontRightMetersPerSecond, | | | | |
| | | | | | | | | | double rearLeftMetersPerSecond, double | | | | |
| | | | | | | | | | rearRightMetersPerSecond) | | | | |
| | X | X | Χ | X | SI | | | MecaWheel_GetAll.vi | , | | | | |
| | X | X | | X | X | | | MecaWheel Normalize.vi | public void normalize(double | | | | |
| | | | | | | | | | attainableMaxSpeedMetersPerSecond) | | | | |
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| | mplemente | ше | Ð | # | Execution | Test Routine | e e | | | | Code Reviev | 2 | Error Checking |
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| | Ē | Documentea | Not WPILIB | Menu Item | ŭ | Je 1 | Sample | VI Name | Function Prototype | Notes | රි | Je Je | Ë |
| SWERVE DRIVE KINEMATICS | X | X | X | X | | | | SwerveKinematics New4.VI | , , , , , , , , , , , , , , , , , , , | For 4 module drives | | | |
| | X | X | X | X | | | | SwerveKinematics NewX.VI | | uses array as input | | | |
| | X | X | X | X | | | | SwerveKinematics_NormalizeWheelSpeeds.vi | public static void normalizeWheelSpeeds(SwerveModuleState[] | does array as input | | | |
| | ^ | _ ^ | _ ^ | ^ | | | | owervertinematics_itormalizevirieelopeeds.vi | moduleStates, double attainableMaxSpeedMetersPerSecond) | | | | |
| | Χ | X | X | X | | | | SwerveKinematics_ToChassisSpeeds4.VI | | For 4 module drives | | | |
| | X | X | X | | | | | SwerveKinematics_rochassisSpeedsX.VI | | uses array as input | | | |
| | \hat{x} | X | | $\frac{1}{X}$ | | | | SwerveKinematics_ToGhassisSpeedsX.vi | public SwerveModuleState[] | acco array as input | | | |
| | ٨ | ^ | | ^ | | | | Swei vertinerrialics_roswei verviodulestates.vr | toSwerveModuleStates(ChassisSpeeds chassisSpeeds, | | | | |
| | | | | | | | | | Translation2d centerOfRotationMeters) | | | | |
| | X | X | | X | | | | SwerveKinematics ToSwerveModuleStatesZeroCenter.VI | public SwerveModuleState[] | | | | |
| | ^ | ^ | | ^ | | | | Oworvershierhanes_roowervervioudieorateszerooenter.vi | toSwerveModuleStates(ChassisSpeeds chassisSpeeds) | | | | |
| | | | | | | | | | public SwerveDriveKinematics(Translation2d wheelsMeters) | variable parameters (replace with | | | |
| | | | | | | | | | public ower vebriver (inclinatios) (translation 24 who districters) | array and "4" calls) | | | |
| | | | | | | | | | public ChassisSpeeds toChassisSpeeds(SwerveModuleState | variable parameters (replace with | | | |
| | | | | | | | | | wheelStates) | array and "4" calls) | | | |
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| | mplemente | Documentec | Not WPILIB | Menu Item | Execution | Test Routine | | VI Name | Function Prototype | Notes | Code Revie | Test | Error |
| OMEDIE DDIVE OD OMETDY | | | _ < | | _Ш_ | | | | Function Prototype | Notes | | | Щ |
| SWERVE DRIVE ODOMETRY | | | | - | | | | SwerveOdometry_Execute4.vi | | | | | |
| | | | | . | | | | SwerveOdometry_ExecuteX.vi | | | | | |
| | Χ | X | | X | | | | SwerveOdometry_GetPosition.VI | public Pose2d getPoseMeters() | | | | |
| | X | X | | X | | | | SwerveOdometry_New.VI | public SwerveDriveOdometry(SwerveDriveKinematics kinematics | | | | |
| | | | | | | | | | Rotation2d gyroAngle, Pose2d initialPose) | | | | |
| | X | X | | X | | | | SwerveOdometry_NewZeroCenter.VI | public SwerveDriveOdometry(SwerveDriveKinematics kinematics | | | | |
| | | | | 1 | | | | | Rotation2d gyroAngle) | | | | |
| | Χ | X | | X | | | | SwerveOdometry_ResetPosition.VI | public void resetPosition(Pose2d pose, Rotation2d gyroAngle) | | | | |
| | Χ | Χ | X | | | | | SwerveOdometry_Update4.VI | | For 4 module drives | | | |
| | Χ | Χ | | X | | | | SwerveOdometry_UpdateWithTime4.VI | | For 4 module drives | | | |
| | | | | | Ι | | | SwerveOdometry UpdateWithTimeX.VI | | | | _ | |
| | X | X | X | X | | | | | | uses array as input | | | |
| | | X | X | X | | | | | | | | | |
| | X | X | X | X | | | | SwerveOdometry_UpdateX.VI | public Pose2d updateWithTime(double currentTimeSeconds | uses array as input | | | |
| | X | X | X | X | | | | | public Pose2d updateWithTime(double currentTimeSeconds, Rotation2d gyroAngle, SwerveModuleState moduleStates) | uses array as input variable parameters (replace with array and "4" calls) | | | |
| | Χ | X | X | X | | | | | Rotation2d gyroAngle, SwerveModuleState moduleStates) | uses array as input variable parameters (replace with array and "4" calls) | | | |
| | Χ | X | X | X | | | | | Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, | uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with | | | |
| | Χ | X | X | X | | | | | Rotation2d gyroAngle, SwerveModuleState moduleStates) | uses array as input variable parameters (replace with array and "4" calls) | | | |
| | Χ | X X | X | X | pé | | | | Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, | uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with | | | |
| | Χ | X X | X | X X | ized | | | | Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, | uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with | | | |
| | Χ | X X | X | X | timized | | am | | Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, | uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with | | | 51 |
| | X X | X | X | X | Optimized | Đ. | am | | Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, | uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with | Me | ш | king |
| | X X | X | X | X | n Optimized | ıtine | Program | | Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, | uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with | sview | gram | ecking |
| | X X | X | X | X X | Ition Optimized | Soutine | Program | | Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, | uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with | Review | Program | Checking |
| | X X | X | X | X X | ecution Optimized | st Routine | Program | | Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, | uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with | | it Program | or Checking |
| | X X | X | X | X X | Execution Optimized | Fest Routine | Program | SwerveOdometry_UpdateX.VI | Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, SwerveModuleState moduleStates) | uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with array and "4" calls) | | Fest Program | Error Checking |
| SWEDVE DDIVE MODULE STATE | X X X X X X X X X X | <i>X</i> Nocumented | Not WPILIB | Wenu Item | 2 Execution Optimized | Test Routine | Sample Program | SwerveOdometry_UpdateX.VI VI Name | Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, SwerveModuleState moduleStates) Function Prototype | uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with | Code Review | Test Program | Error Checking |
| SWERVE DRIVE MODULE STATE | X X Implemented | X Documented | X | X Wenu Item | SI | Test Routine | Sample Program | SwerveOdometry_UpdateX.VI VI Name SwerveModuleState_CompareTo.vi | Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, SwerveModuleState moduleStates) | uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with array and "4" calls) | | Test Program | Error Checking |
| SWERVE DRIVE MODULE STATE | X X Implemented | X Documented | X | X Wenu Item | SI SI | Test Routine | Sample Program | SwerveOdometry_UpdateX.VI VI Name SwerveModuleState_CompareTo.vi SwerveModuleState_Get.vi | Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, SwerveModuleState moduleStates) Function Prototype public int compareTo(SwerveModuleState o) | uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with array and "4" calls) | | Test Program | Error Checking |
| SWERVE DRIVE MODULE STATE | X X Implemented | X Documented | X | X Wenu Item | SI | Test Routine | Sample Program | SwerveOdometry_UpdateX.VI VI Name SwerveModuleState_CompareTo.vi | Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, SwerveModuleState moduleStates) Function Prototype public int compareTo(SwerveModuleState o) public SwerveModuleState(double speedMetersPerSecond, | uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with array and "4" calls) | | Test Program | Error Checking |
| SWERVE DRIVE MODULE STATE | X X Implemented | X Documented | X | X X Wenu Item | SI SI SI | Test Routine | Sample Program | SwerveOdometry_UpdateX.VI VI Name SwerveModuleState_CompareTo.vi SwerveModuleState_Get.vi SwerveModuleState_New.vi | Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, SwerveModuleState moduleStates) Function Prototype public int compareTo(SwerveModuleState o) public SwerveModuleState(double speedMetersPerSecond, Rotation2d angle) | uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with array and "4" calls) Notes | | Test Program | Error Checking |
| SWERVE DRIVE MODULE STATE | X X Implemented | X Documented | X | X Wenu Item | SI SI | Test Routine | Sample Program | SwerveOdometry_UpdateX.VI VI Name SwerveModuleState_CompareTo.vi SwerveModuleState_Get.vi | Rotation2d gyroAngle, SwerveModuleState moduleStates) public Pose2d update(Rotation2d gyroAngle, SwerveModuleState moduleStates) Function Prototype public int compareTo(SwerveModuleState o) public SwerveModuleState(double speedMetersPerSecond, | uses array as input variable parameters (replace with array and "4" calls) variable parameters (replace with array and "4" calls) Notes | | Test Program | Error Checking |

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| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checkina |
|-----------------------------|-------------------|--------------|------------|---|-----------------------|---------------------------|-------------------------------|---|---|--|-------------------------|----------------------------|----------------|
| CUBIC HERMITE SPLINE | | | | | | | | • | protected SimpleMatrix getCoefficients() | not needed, use cluster unpack | | | |
| | X | X | | X | | | | CubicHermiteSpline_getControlVectorFromArrays.vi | private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) | | | | |
| | X | X | | X | | | | CubicHermiteSpline_makeHermiteBasis.vi | private SimpleMatrix makeHermiteBasis() | | | | |
| | X | X | | X | | | | CubicHermiteSpline_New.vi | public CubicHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector) | | | | |
| POSE WITH CURVATURE | × Implemented | X Documented | Not WPILIB | Menu Item | ର Execution Optimized | Test Routine | | VI Name PoseWithCurve_New.vi | Function Prototype public PoseWithCurvature(Pose2d poseMeters, double | Notes | Code Review | Test Program | Fror Checking |
| | | ^ | | ^ | · | | | 1 00011111104110411111 | curvatureRadPerMeter) | | | | |
| | | | | | | | | | public PoseWithCurvature() | can use cluster constant | | | |
| | | | | | | | | | public Pose2d poseMeters | not needed, use cluster unpack | | | |
| | | | | | | | | | public double curvatureRadPerMeter | not needed, use cluster unpack | | | |
| | nented | nented | PILIB | Item | tion Optimized | Routine | le Progra | | | | Review | rogram | : |
| QUINTIC HERMITE SPLINE | | X Documented | Not WPILIB | X Menu Item | Execution Opt | Test Routine | | VI Name QuinticHermiteSpline_getControlVectorFromArrays.vi | Function Prototype private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() | Notes | Code Review | Test Program | Ĺ |
| UINTIC HERMITE SPLINE | | | Not WPILIB | Menu Item | | Test Routine | | | private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public QuinticHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector. | Notes | Code Review | Test Program | |
| QUINTIC HERMITE SPLINE | X | X | Not WPILIB | X Menu Item | | Test Routine | | QuinticHermiteSpline_getControlVectorFromArrays.vi QuinticHermiteSpline_makeHermiteBasis.vi | private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public QuinticHermiteSpline(double[] xInitialControlVector, | Notes not needed, use cluster unpack | Code Review | Test Program | |
| | X | X X X X | Not WPILIB | X X Wenu Item | | Test Routine Test Routine | Sample Program | QuinticHermiteSpline_getControlVectorFromArrays.vi QuinticHermiteSpline_makeHermiteBasis.vi QuinticHermiteSpline_New.vi | private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public QuinticHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector. | | Code Review Code Review | Test Program Test Program | |
| | X | X X X X | Not WPILIB | Menu Item X X X Menu Item | Optimized Execution | | Sample Program | QuinticHermiteSpline_getControlVectorFromArrays.vi QuinticHermiteSpline_makeHermiteBasis.vi QuinticHermiteSpline_New.vi | private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public QuinticHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector) protected SimpleMatrix getCoefficients() Function Prototype public PoseWithCurvature getPoint(double t) Spline(int degree) | not needed, use cluster unpack | | Program | |
| | X | X X X X | Not WPILIB | Menu Item X X X Menu Item | Optimized Execution | | Sample Program | QuinticHermiteSpline_getControlVectorFromArrays.vi QuinticHermiteSpline_makeHermiteBasis.vi QuinticHermiteSpline_New.vi | private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public QuinticHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector) protected SimpleMatrix getCoefficients() Function Prototype public PoseWithCurvature getPoint(double t) Spline(int degree) public static class ControlVector | not needed, use cluster unpack Notes | | Program | |
| UINTIC HERMITE SPLINE | X | X X X X | Not WPILIB | Menu Item X X X Menu Item | Optimized Execution | | Sample Program | QuinticHermiteSpline_getControlVectorFromArrays.vi QuinticHermiteSpline_makeHermiteBasis.vi QuinticHermiteSpline_New.vi | private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public QuinticHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector) protected SimpleMatrix getCoefficients() Function Prototype public PoseWithCurvature getPoint(double t) Spline(int degree) | not needed, use cluster unpack | | Program | |
| | Implemented X X X | X X X X | Not WPILIB | Menu Item X X X Menu Item X X X Menu Item | Optimized Execution | | Sample Program Sample Program | QuinticHermiteSpline_getControlVectorFromArrays.vi QuinticHermiteSpline_makeHermiteBasis.vi QuinticHermiteSpline_New.vi | private SimpleMatrix getControlVectorFromArrays(double[] initialVector, double[] finalVector) private SimpleMatrix makeHermiteBasis() public QuinticHermiteSpline(double[] xInitialControlVector, double[] xFinalControlVector, double[] yInitialControlVector, double[] yFinalControlVector) protected SimpleMatrix getCoefficients() Function Prototype public PoseWithCurvature getPoint(double t) Spline(int degree) public static class ControlVector | not needed, use cluster unpack Notes implemented as data structure | | Program | |

| Y | Y | | Y | | X | SplineHelp GetCubicCtrlVectorsFromWayPts.vi | public static Spline.ControlVector[] | | |
|---|---|---|----|----|---|---|--|--------------|--|
| ^ | ^ | | ^ | | ^ | Opiliter leip_detoubleotitivectorsi Torrivvayi ts.vi | getCubicControlVectorsFromWaypoints(Pose2d start, | | |
| | | | | | | | Translation2d[] interiorWaypoints, Pose2d end) | | |
| Χ | Χ | Χ | X | | | SplineHelp GetCubicCtrlVectorsFromWeightedWayPts.vi | Translationza[] interior vraypointe; 1 03024 ond) | | |
| Χ | Χ | Χ | No | | | SplineHelp_GetCubicSpline_Calc1.vi | | internal | |
| Χ | X | Χ | No | | | SplineHelp_GetCubicSpline_Calc2.vi | | internal | |
| Χ | X | Χ | No | | | SplineHelp_GetCubicSpline_Calc3.vi | | internal | |
| Χ | Χ | | X | | X | SplineHelp_getCubicSplinesFromControlVectors.vi | public static CubicHermiteSpline[] | | |
| | | | | | | | getCubicSplinesFromControlVectors(Spline.ControlVector start, | | |
| | | | | | | | Translation2d[] waypoints, Spline.ControlVector end) | | |
| X | X | | X | SI | | SplineHelp_GetQuinticCtrlVector.vi | private static Spline ControlVector getQuinticControlVector(double | | |
| | | | | | | | scalar, Pose2d point) | | |
| | | | | | | SplineHelp_GetQuinticCtrlVectorsFromWayPts.vi | li i | REMOVED 2762 | |
| | | | | | | | getQuinticControlVectorsFromWaypoints(List <pose2d></pose2d> | | |
| | | | | | | | waypoints) | | |
| | | | | | | SplineHelp_GetQuinticCtrlVectorsFromWeightedWayPts.vi | | REMOVED 2762 | |
| Χ | X | | X | | | SplineHelp_getQuinticSplinesFromControlVectors.vi | public static QuinticHermiteSpline[] | | |
| | | | | | | · · · · - · · · · | getQuinticSplinesFromControlVectors(Spline.ControlVector[] | | |
| | | | | | | | controlVectors) | | |
| Χ | X | X | X | | | SplineHelp_GetQuinticSplinesFromWeightedWayPts.vi | , | New 2762 | |
| Χ | X | | X | | | SplineHelp_GetQuinticSplinesFromWayPts.vi | | New 2762 | |
| X | X | | No | | | SplineHelp_ThomasAlgorithm.vi | private static void thomasAlgorithm(double[] a, double[] b, double[] | internal | |
| | | | | | | | c, double[] d, double[] solutionVector) | | |

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

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

| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | Function Prototype | Notes | Code Review | Test Program | Error Checking |
|------------|-------------|------------|------------|-----------|---------------------|--------------|-----------------------------|--|---|-------------|--------------|----------------|
| TRAJECTORY | | X | | X | | | Trajectory_Concatenate.vi | | | | | |
| | Χ | X | | X | | | Trajectory_equals.vi | boolean equals(other obj) | FUTURE | | | |
| | Χ | X | | X | SI | | Trajectory_GetStates.vi | public List <state> getStates()</state> | not needed, use unpack | | | |
| | Χ | X | | X | SI | | Trajectory_GetTotalTime.vi | public double getTotalTimeSeconds() | not needed, use unpack | | | |
| | X | X | | No | SI | | Trajectory_lerp_double.vi | private static double lerp(double startValue, double endValue, double t) | internal | | | |
| | X | X | | No | SI | | Trajectory_lerp_Pose.vi | private static Pose2d lerp(Pose2d startValue, Pose2d endValue, double t) | internal | | | |
| | X | X | | X | SI | | Trajectory_New_Empty.vi | | | | | |
| | Χ | Χ | | X | SI | | Trajectory_New.vi | public Trajectory(final List <state> states)</state> | | | | |
| | Χ | Χ | | X | | | Trajectory_RelativeTo.vi | public Trajectory relativeTo(Pose2d pose) | | | | |
| | Χ | Χ | | X | | | Trajectory_Sample.vi | public State sample(double timeSeconds) | | | | |
| • | X | X | X | X | | | Trajectory_SampleReverse.vi | | Sample in reverse order. Negate sample. | | | |
| | Χ | Χ | | 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 16 / 38 FRC LabVIEW Trajectory Library - VI Implementation List Revision 2.X 11/06/2022 – added various routines Execution Optimized Routine WPILIB Menu Item Not **Function Prototype** Notes TRAJECTORY_STATE X X TrajectoryState Equals.vi X SI boolean equals(other obj) X X SI TrajectoryState GetAll.vi Χ Χ XX X SI TrajectoryState GetPose.vi X X TrajectoryState Interpolate.vi Χ State interpolate(State endValue, double i) X Χ SI TrajectoryState New.vi Χ public State(double timeSeconds, double velocityMetersPerSecond, double accelerationMetersPerSecondSq, Pose2d poseMeters, double curvatureRadPerMeter) public State() Execution Optimizea Routine Venu Item Function Prototype VI Name Notes Implemented differently, can't TRAJECTORY CONFIG TrajectoryConfig AddConstraint.vi public TrajectoryConfig addConstraint(TrajectoryConstraint constraint) duplicate. TrajectoryConfig AddConstraints.vi public TrajectoryConfig addConstraints(List<? extends Χ Implemented differently, can't TrajectoryConstraint> constraints) public TrajectoryConfig(double maxVelocityMetersPerSecond. Χ X SI TrajectoryConfig Create.vi X double maxAccelerationMetersPerSecondSq) TrajectoryConfig_GetCentripetalAccel.vi X Χ X TrajectoryConfig GetConstraints.vi X Χ public List<TrajectoryConstraint> getConstraints() X Χ Implemented differently, can't can use cluster unpack XX X TrajectoryConfig GetEndVelocity.vi public double getEndVelocity() TrajectoryConfig GetKinematicsDiffDrive.vi $X \mid X$ X TrajectoryConfig GetKinematicsMecanumfDrive.vi XX X TrajectoryConfig_GetKinematicsSwerveDrive.vi Χ X X X Χ X TrajectoryConfig_GetMaxVelAccel.vi X X X TrajectoryConfig GetStartVelocity.vi public double getStartVelocity() can use cluster unpack TrajectoryConfig GetVoltageDiffDrive.vi X Χ Χ X X TrajectoryConfig IsReversed.vi public boolean isReversed() X can use cluster unpack X X SI Χ Χ TrajectoryConfig_setCentripetalAccel.vi X X TrajectoryConfig_SetEndVelocity.vi public TrajectoryConfig setEndVelocity(double endVelocityMetersPerSecond) public TrajectoryConfig setKinematics(DifferentialDriveKinematics X TrajectoryConfig setKinematicsDiffDrive.vi Χ Χ SI kinematics) Χ X Χ SI TrajectoryConfig setKinematicsMecanumfDrive.vi public TrajectoryConfig setKinematics(MecanumDriveKinematics kinematics) X X X SI TrajectoryConfig setKinematicsSwerveDrive.vi public TrajectoryConfig setKinematics(SwerveDriveKinematics kinematics) public TrajectoryConfig setReversed(boolean reversed) SI TrajectoryConfig_setReversed.vi Χ X X TrajectoryConfig_SetStartVelocity.vi public TrajectoryConfig setStartVelocity(double X X Χ startVelocityMetersPerSecond) TrajectoryConfig_setVoltageDiffDrive.vi X X X X SI public double getMaxVelocity() Created function to return both public double getMaxAcceleration() Created function to return both NOTE ADD OTHER "SET" ROUTINES FOR OTHER CONTRAINTS HERE, SINCE NEW CONTRAINTS ARE SPECIFIC AND NOT GENERIC.

Test Program est Routine Vot WPILIB Venu Item Function Prototype Notes

| Revision 2.X 11/06/2022 – added various routines | | | | | | | | | | | | |
|--|-------------|--------------------------|-------------|-------------|---------------------|--------------|--|--|--|-------------|--------------|----------------|
| | | | | T | | | | | 1 | | | |
| TRAJECTORY GENERATE | X | X | | X | | | TrajectoryGenerate_Make_Cubic_CtrlVect.vi | initial, List <translation2d> interiorWaypoints, Spline,ControlVector</translation2d> | uses cubic splines | | | |
| | | X | | X | | | TrajectoryGenerate_Make_Cubic.vi | end, TrajectoryConfig config) public static Trajectory generateTrajectory(Pose2d start, List <translation2d> interiorWaypoints, Pose2d end, TrajectoryConfig config)</translation2d> | uses cubic splines | | | |
| | X | X | X | X | | | TrajectoryGenerate_Make_Generic.vi | Helper to bring these all together | Use this one!!! | | | |
| | X | X | | X | | | TrajectoryGenerate_Make_Quintic_CtrlVect.vi | public static Trajectory generateTrajectory(ControlVectorList controlVectors, TrajectoryConfig config) | uses quintic splines | | | |
| | X | X | X | | | | TrajectoryGenerate_Make_Quintic_Weighted.vi | | New 2762 | | | |
| | X | X | | X | _ | | TrajectoryGenerate_Make_Quintic.vi TrajectoryGenerate_splinePointsFromSplines.vi | waypoints, TrajectoryConfig config) public static List <posewithcurvature></posewithcurvature> | uses quintic splines | | | |
| | mplemented | Documented | WPILIB | Item | Execution Optimized | est Routine | | splinePointsFromSplines(Spline[] splines) | | Review | rogram | Checking |
| |)er | cnu | 3 | lenu | ကာမ | st Ro | | | | Code | St F | 9 |
| | lm | ρŏ | Not | Me | Exe | 7es | VI Name | Function Prototype | Notes | Õ | Test | Err |
| TRAJECTORY GENERATE (Control Vector) | | | | | | | | · | may not need, just data | | | |
| , | | | | | | | | | may not need, just data | | | |
| | | | | | | | | | may not need, just data | | | |
| | 'mplemented | ocumented | Vot WPILIB | Wenu Item | Execution Opt | Test Routine | | | | ode Review | Test Program | Error Checking |
| | | ρ̈́ | | | _ <u>~</u> | <u>6</u> 2 | | Function Prototype | Notes | Cod | | <u> </u> |
| TRAJECTORY PARAMETERIZE | | | | | \longrightarrow | | TrajectoryParam_calcStuffFwd.vi | | | | | |
| | X | X | X | | | | TrajectoryParam_calcStuffRev.vi | | T | | | |
| | X | X | X | No No | _ | | TrajectoryParam_enforceAccel.vi TrajectoryParam_enforceVelocity.vi | List <trajectoryconstraint> constraints, ConstrainedState state)</trajectoryconstraint> | This routines needs to be changed when new constraints are added. This routines needs to be changed | | | |
| | | | | | | | T : | | 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> | | | | |
| | | | | | | | | | | | | |
| | mplemented | <i>Documented</i> | Vot WPILIB | Venu Item | Execution Optimized | Test Routine | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| TRAJECTORY PARAMETERIZE CONSTRAINED STATE | | | | X Menu Item | Execution Optimized | Test Routine | ConstrainedState_New.vi | Function Prototype ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double maxAccelerationMetersPerSecondSq) | Notes | Code Review | Test Program | Error Checking |
| TRAJECTORY PARAMETERIZE CONSTRAINED STATE | X | X | X | X | Execution Optimized | Test Routine | ConstrainedState_New.vi ConstrainedState_SetMaxAccel.vi | ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double | Notes | Code Review | Test Program | Ŏ. |
| TRAJECTORY PARAMETERIZE CONSTRAINED STATE | X X X | X X X | X | X X X | Execution Optimized | Test Routine | ConstrainedState_New.vi | ConstrainedState(PoseWithCurvature pose, double distanceMeters, double maxVelocityMetersPerSecond, double minAccelerationMetersPerSecondSq, double | Notes | Code Review | Test Program | Ŏ. |

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DIFF DRIVE KINEMATIC CONSTRAINT X X

X

Revision 2.X 11/06/2022 – added various routines scution Optimized

| | Jul | Doc | Not | Me | EXE | ŀ | es / | งี้ VI Name | Function Prototype | Notes | ŏ | 7es | Em |
|-----------------|-----|-----|-----|----|----------|---|---------|--|---|-------|---|-----|----|
| TRAJECTORY UTIL | Χ | Χ | | X | | | | TrajectoryUtil_fromPathWeaverJSON.vi | public static Trajectory fromPathweaverJson(Path path) | | | | |
| | Χ | Χ | X | X | X | | | TrajectoryUtil_MakeWeightedWayPoint_ENG.vi | | | | | |
| | Χ | X | X | X | X | ' | | TrajectoryUtil_MakeWeightedWayPoint.vi | | | | | |
| | X | X | | X | | | | TrajectoryUtil_toPathWeaverJSON.vi | public static void toPathweaverJson(Trajectory trajectory, Path path) | | | | |
| | | | | | | | | | public static Trajectory deserializeTrajectory(String json) | | | | |
| | | | | | | | | | public static String serializeTrajectory(Trajectory trajectory) | | | | |
| | | | | | otimized | | | ram | | | | | |

Function Prototype Notes TRAPEZOID PROFILE X X Χ TrapProfConstraint_New.vi X TrapProfile Calculate.vi XX No TrapProfile_Direct.vi Private, remove from menu X X X X TrapProfile_Execute.vi X X X X SI TrapProfile_Execute_AtGoal.vi XX Χ TrapProfile_IsFinished.vi XX X TrapProfile_New_DefInitial.vi XX X TrapProfile_New.vi Χ X No TrapProfile_ShouldFlipAcceleration.vi Private, remove from menu Χ Χ X TrapProfile_TimeLeftUntil.vi Χ Χ Χ TrapProfile_TotalTime.vi X X X TrapProfState_Equals.vi X X TrapProfState_New.vi

'======== TRAJECTORY CONSTRAINT '======== Menu Item Function Prototype Notes public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double CENTRIPETAL ACCELERATION CONSTRAINT X Χ CentripetalAccelConstraint_getMaxVelocity.vi velocityMetersPerSecond) XX X CentripetalAccelConstraint_getMinMaxAccel.vi public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) X SI public CentripetalAccelerationConstraint(double X CentripetalAccelConstraint_New.vi Can use cluster pack for now maxCentripetalAccelerationMetersPerSecondSq) Execution Optimized Not WPILIB Menu Item

DiffDriveKinematicsConstraint_getMaxVelocity.vi

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Function Prototype

velocityMetersPerSecond)

public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double

Notes

| 2022 – added various routines | | | | | | | | | - | |
|-------------------------------|-----------------|----------------|----------------|---------------|-------------------------|--------------|----------------|--|---|-------------------------------------|
| | Χ | X | | X | | | | DiffDriveKinematicsConstraint_getMinMaxAccel.vi | public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) | |
| | X | X | | X | SI | | | DiffDriveKinematicsConstraint_New.vi | public DifferentialDriveKinematicsConstraint(final DifferentialDriveKinematics kinematics, double maxSpeedMetersPerSecond) | |
| DIFF DRIVE VOLTAGE CONSTRAINT | X Implemented | X Documented | Not WPILIB | X Menu Item | Execution Optimized | Test Routine | Sample Program | VI Name DiffDriveVoltageConstraint_getMaxVelocity.vi DiffDriveVoltageConstraint_getMinMaxAccel.vi | Function Prototype public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSg(Pose2d poseMeters, | Notes |
| | X | X | | X | SI | | | DiffDriveVoltageConstraint_New.vi | double curvatureRadPerMeter, double velocityMetersPerSecond) public DifferentialDriveVoltageConstraint(SimpleMotorFeedforward feedforward, DifferentialDriveKinematics kinematics, double maxVoltage) | |
| ELLIPTICAL REGION CONSTRAINT | X X Implemented | X X Documented | Not WPILIB | X X Menu Item | Execution Optimized | Test Routine | Sample Program | VI Name EllipRegionConstraint_getMaxVelocity.vi EllipRegionConstraint_getMinMaxAccel.vi EllipRegionConstraint_IsPoseInRegion.vi EllipRegionConstraint_New.vi | Function Prototype | Notes |
| JERK CONSTRAINT | / / Implemented | Documented | X X Not WPILIB | Menu Item | Secution Optimized | Test Routine | Sample Program | VI Name JerkConstraint_getMaxVelocity.vi JerkConstraint_getMinMaxAccel.vi JerkConstraint_New.vi | Routine exists, it is just a shell Routine exists, it is just a shell | Notes FUTURE FUTURE FUTURE |
| MAX VELOCITY CONSTRAINT | X X Implemented | X X Documented | Not WPILIB | X X Menu Item | S S Execution Optimized | Test Routine | Sample Program | VI Name MaxVelocityConstraint_getMaxVelocity.vi MaxVelocityConstraint_getMinMaxAccel.vi MaxVelocityConstraint_New.vi | Function Prototype | Notes |

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| 11/06/2022 – added various routines | | | | | | | | | - | |
|-------------------------------------|---|---------------------------|---------------------------|---------------------------|---|---------------------------|----------------|--|--|-------------------------------------|
| 1 1/00/2022 added various routiles | | | | | ā | | | | | |
| MECANUM DRIVE KINEMATICS CONSTRAINT | X X Implemented | X X Documented | Not WPILIB | X X Menu Item | ত Execution Optimized | Test Routine | Sample Program | VI Name MecaDriveKinematicsConstraint_getMaxVelocity.vi MecaDriveKinematicsConstraint_getMinMaxAccel.vi MecaDriveKinematicsConstraint_New.vi | Function Prototype | Notes |
| | | | | | ~ | | | | | |
| RECTANGULAR REGION CONSTRAINT [| X Implemented | X Documented | Not WPILIB | X Menu Item | Execution Optimized | Test Routine | Sample Program | VI Name RectRegionConstraint_getRectRegion.vi | Function Prototype | Notes |
| | X | X | | X | | | | RectRegionConstraint_getMinMaxAccel.vi | | |
| | X | X | | X | | | | RectRegionConstraint_IsPoseInRegion.vi | | |
| | X | X | | X | | | | RectRegionConstraint_New.vi | | |
| L | | | l | | | l | | r teoti tegiori constraint_rtow.vi | | |
| SWERVE DRIVE KINEMATICS CONSTRAINT | X Implemented | X Documented | Not WPILIB | X Menu Item | ত্ৰ Execution Optimized | Test Routine | | VI Name SwerveDriveKinematicsConstraint_getMaxVelocity.vi SwerveDriveKinematicsConstraint_getMinMaxAccel.vi SwerveDriveKinematicsConstraint_New.vi | public double getMaxVelocityMetersPerSecond(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) public MinMax getMinMaxAccelerationMetersPerSecondSq(Pose2d poseMeters, double curvatureRadPerMeter, double velocityMetersPerSecond) | Notes Can use cluster pack for now |
| | ^ | ^ | | ^ | 31 | | | SwerveDriveRinematicsConstraint_INew.vi | SwerveDriveKinematics kinematics, double | Can use cluster pack for now |
| | | | | | | | | | maxSpeedMetersPerSecond) | |
| TRAJECTORY CONSTRAINT | Implemented $X \mid X \mid$ Implemented | Documented X X Documented | Not WPILIB X X Not WPILIB | Menu Item X X X Menu Item | Execution Optimized Execution Optimized | Test Routine Test Routine | mple Program | VI Name TrajConstraint_GetMaxVelocity.vi TrajConstraint_GetMinMaxAccel.vi TrajConstraint_GetType.vi | Function Prototype | Notes |
| | | | Ž | | | <u> </u> | Ŋ | VI Name | | Notes |
| TRAJECTORY CONSTRAINT (Min Max) | Χ | Χ | | X | SI | | | Constraint_MinMax_New.vi | Constraint_MinMax_New | |
| | Χ | X | | X | SI | | | Constraint_MinMax_NewMinMax.VI | Constraint_MinMax_New | |

'========= UTILITY

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

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| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | VI Name | Function Prototype | Notes |
|------|-------------|------------|------------|-----------|---------------------|--------------|----------------|---|--------------------|---|
| UTIL | X | Χ | Χ | X | SI | | | Util ApproxEqual.vi | | |
| | Χ | Χ | X | X | | | | Util_Array_PoseWCurv_to_XY.vi | | |
| | Χ | Χ | X | X | SI | | | Util_CalcDist.vi | | |
| | Χ | Χ | X | X | SI | | | Util_GetLibraryVersion.vi | | |
| | Χ | Χ | X | X | SI | | | Util_GetLibUsage.vi | | |
| | Χ | Χ | 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 | X | X | | | | Util Trajectory Absolute To Relative.vi | | ű |
| | 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 | X | X | | | | Util_Trajectory_WriteFile_Pathweaver.vi | | |
| | Χ | Χ | X | 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 | Χ | X | | | | Util_TrajectoryState_Meters_To_Inches.vi | | |
| | Χ | Χ | X | X | | | | Util_TrajState_to_DiffDrive_WheelPos.vi | | |
| | Χ | Χ | Χ | X | | | | Util_DispWaypoint_Eng_To_SI.vi | | |
| | Χ | Χ | Χ | X | | | | Util_DispWaypoint_To_CubicInput.vi | | |
| | Χ | Χ | X | X | | | | Util_DispWaypoint_To_QuinticInput.vi | | |
| | Χ | Χ | X | X | | | | Util_DispWeightedWaypiont_Eng_To_WeightedWaypoint | | |
| | 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 Optimize | Test Routine | Sample Program | VI Name | Function Prototype | Notes |
|------|-------------|------------|------------|-----------|--------------------|--------------|----------------|------------------------------|--------------------|-------|
| CONV | Χ | Χ | Χ | Χ | SI | | | Conv_AngleDegrees_Heading.vi | | |
| | Χ | Χ | X | Χ | SI | | | Conv_AngleRadians_Heading.vi | | |
| | Χ | Χ | Χ | Χ | SI | | | Conv_Centimeters_Meters.vi | | |
| | Χ | Χ | Χ | Χ | SI | | | Conv_Deg_Radians.vi | | |
| | Χ | Χ | X | Χ | SI | | | Conv_Deg_Rotations.vi | | |
| | Χ | Χ | X | Χ | SI | | | Conv_Feet_Meters.vi | | |
| | Χ | Χ | X | Χ | SI | | | Conv_GyroDegrees_Heading.vi | | |
| | Χ | Χ | Χ | Χ | SI | | | Conv_Heading_AngleRadians.vi | | |
| | Χ | Χ | Χ | Χ | SI | | | Conv_Inches_Meters.vi | | |
| | Χ | Χ | Χ | Χ | SI | | | Conv_Kilograms_Pounds.vi | | |
| | Χ | Χ | Χ | Χ | SI | | | Conv_Meters_Feet.vi | | |
| | Χ | Χ | Χ | Χ | SI | | | Conv_Meters_Inches.vi | | |
| | Χ | Χ | Χ | Χ | SI | | | Conv_Pose2d_SI_Eng.vi | | |
| | Χ | Χ | Χ | Χ | SI | | | Conv_Pounds_Kilograms.vi | | |
| | Χ | X | Χ | Χ | SI | | | Conv_Radians_Deg.vi | | |
| | Χ | Χ | Χ | Χ | SI | | | Conv_Radians_Rotations.vi | | |
| | Χ | Χ | Χ | Χ | SI | | | Conv_Rotations_Deg.vi | | |
| | Χ | Χ | Χ | Χ | SI | | | Conv_Rotations_Radians.vi | | |
| | X | X | X | X | SI | | | Conv Yards Meters.vi | | |

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

'========= PATHFINDER UTIL '========

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

Function Prototype Notes PathfinderUtil_Continuous_Heading_Difference.vi
PathfinderUtil_OptimizeTrajectoryStates.vi
PathfinderUtil_ToTrajectory.vi
PathfinderUtil_ToTrajectoryStates.vi

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

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

| XX | X SI | DCMotor_PickMotor.vi | | | |
|----|------|----------------------|--|--|--|
| | | | | | |

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

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

| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimi: | Test Routine | รับ อัน อัน อัน VI Name Function Prototype | Notes | Code Review | Test Program | Error Checking |
|-----------------------------------|-------------|------------|------------|-----------|-------------------|--------------|---|-------|-------------|--------------|----------------|
| DIFFERENTIAL DRIVE POSE ESTIMATOR | X | Χ | | X | | | DiffDrivePoseEst_AddVisionMeasurement.vi | | | | |
| | X | Χ | | X | | | DiffDrivePoseEst_FillStateVector.vi | | | | |
| | Χ | Χ | | X | | | DiffDrivePoseEst_GetEstimatedPosition.vi | | | | |
| | Χ | Χ | | X | | | DiffDrivePoseEst_Kalman_F_Callback.vi | | | | |
| | X | Χ | | X | | | DiffDrivePoseEst_Kalman_H_Callback.vi | | | | |
| | Χ | Χ | | X | | | DiffDrivePoseEst_New.vi | | | | |
| | X | Χ | | X | | | DiffDrivePoseEst_ResetPosition.vi | | | | |
| | X | Χ | | X | | | DiffDrivePoseEst_SetVisionMeasurementStdDevs.vi | | | | |
| | Χ | Χ | | X | | | DiffDrivePoseEst_Update.vi | | | | |
| | Χ | Χ | | X | | | DiffDrivePoseEst_UpdateWithTime.vi | | | | |
| | Χ | Χ | | X | | | DiffDrivePoseEst_VisionCorrect_Callback.vi | | | | |
| | Χ | Χ | | X | | | DiffDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi | | | | |

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

| 11/06/2022 – added various routines | | | | | | | | | | | |
|-------------------------------------|-------------|------------|------------|---------------------|-----------|--------------|--|--|-------------|--|------------|
| | | | | | zed | | | | | | |
| | | | | | imi | | $\mu_{\mathbf{e}}$ | | | | 6 |
| | þ | g | ~ | | Opt | ē | 200 | | 8 | E | Checking |
| | Implementec | nte | Vot WPILIB | E | | Test Routine | Prog | | Code Review | Test Program | oeci |
| | шe | Documen | Ą | Menu Item | Execution | Ro | bla Black | | Å. | Pro | 5 |
| | e)d | noc | 7 7 | ent | ec | st | E | | ge | st | Error |
| | | | _ ≥ | | Щ | | | Notes | ၓ | | Ē |
| KALMAN FILTER | | | | X | | X | KalmanFilter_Correct.vi | | | | |
| | X | | | X | | | KalmanFilter_GetK | | | | |
| | X | X | | X | | | KalmanFilter_GetK_Single.vi | | | | |
| | X | X | | X | | | KalmanFilter_GetXHat | | | | |
| | X | X | | X | | Χ | KalmanFilter_GetXHaT_Single | | | | |
| | X | X | | X | | Χ | KalmanFilter_New.vi | | | | |
| | X | X | | X | | X | KalmanFilter_Predict.vi | | | | |
| | X | X | | X | | | KalmanFilter_Reset.vi | | | | |
| | X | X | | X | | | KalmanFilter_SetXHat | | | | |
| | X | X | | X | | X | KalmanFilter_SetXHat_Single | | | | |
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| | <u>=</u> | | 8 | Menu | Execution | <u>1</u> | ชื่อ เมื่อ VI Name Function Prototype | Notes | රි | Test | Error |
| KALMAN FILTER LATENCY COMPENSATOR | X | X | | X | | | KalmanFilterLatencyComp_AddObserverState.vi | | | | |
| | X | X | | X | | | KalmanFilterLatencyComp_ApplyPastGlobalMeas_FuncGroup.vi | | | | |
| | | | | | | | | | | | |
| | X | X | | X | | | KalmanFilterLatencyComp_ApplyPastGlobalMeasurement_UKF.vi | | | | |
| | X | X | | X | | | KalmanFilterLatencyComp_FindClosestMeasurement.vi | | | | |
| | X | | | X | | | KalmanFilterLatencyComp_New.vi | | | | |
| | X | X | | X | | | KalmanFilterLatencyComp_Observer_New.vi | | | | |
| | X | X | | X | | | KalmanFilterLatencyComp_Reset.vi | | | | |
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| MECANUM DRIVE POSE ESTIMATOR | | <u> </u> | _< | _ < | | _ | MecaDrivePoseEst_AddVisionMeasurement_StdDev.vi | Notes | | | Ш |
| MEGANOM DRIVE FOSE ESTIMATOR | | X | | X | | | MecaDrivePoseEst_AddVisionMeasurement.vi | | | | |
| | X | X | | $\frac{\lambda}{X}$ | | | MecaDrivePoseEst GetEstimatedPosition.vi | | | | |
| | X | | | No | | | MecaDriveFoseEst_GeteStilinatedFostitoff.vi MecaDriveFoseEst_Kalman_F_Callback.vi | | | | |
| | X | X | | No | | | MecaDrivePoseEst Kalman H Callback.vi | | | | |
| | X | | | X | | | MecaDrivePoseEst_New.vi | | | | |
| | X | | | X | | | MecaDrivePoseEst ResetPosition.vi | | | | |
| | X | X | | X | | | MecaDrivePoseEst SetVisionMeasurementStdDevs.vi | | | | |
| | X | X | | X | | | MecaDrivePoseEst_Update.vi | | | | |
| | X | | | X | | | MecaDrivePoseEst_UpdateWithTime.vi | | | | |
| | X | X | | No | | | MecaDrivePoseEst VisionCorrect Callback.vi | | | | |
| | X | | | No | | | MecaDrivePoseEst VisionCorrect Kalman H Callback.vi | | | | |
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| SWERVE DRIVE POSE ESTIMATOR | == | <u> </u> | _ < | _ ≥ | Щ | _ | VI Name Function Prototype SwerveDrivePoseEst AddVisionMeasurement StdDev.vi | INULES | U | <u> </u> | Ш |
| SVALIVAL DIVIAL LOSE ESTIMATOR | | 1 | | | | | OWOLVODING GOELOL MUNICIONINICADUICHICH CIUDEN.VI | The state of the s | 1 | 1 | |

| X | X | X | | SwerveDrivePoseEst_AddVisionMeasurement.vi | |
|---|---|---|--|---|--|
| X | X | X | | SwerveDrivePoseEst_GetEstimatedPosition.vi | |
| X | X | X | | SwerveDrivePoseEst_Kalman_F_Callback.vi | |
| X | X | X | | SwerveDrivePoseEst_Kalman_H_Callback.vi | |
| X | X | X | | SwerveDrivePoseEst_New.vi | |
| X | X | X | | SwerveDrivePoseEst_ResetPosition.vi | |
| X | X | X | | SwerveDrivePoseEst_SetVisionMeasurementStdDevs.vi | |
| X | X | X | | SwerveDrivePoseEst_Update.vi | |
| X | X | X | | SwerveDrivePoseEst_UpdateWithTime.vi | |
| X | X | X | | SwerveDrivePoseEst_VisionCorrect_Callback.vi | |
| X | X | X | | SwerveDrivePoseEst_VisionCorrect_Kalman_H_Callback.vi | |
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| UNSCENTED KALMAN FILTER | | X | | X | | | UnscentedKalmanFilter_Correct_FuncGroup.vi | | | | | |
| | Χ | Χ | | X | | | UnscentedKalmanFilter_Correct_OnlyUY.vi | | | | | |
| | Χ | Χ | | X | | | UnscentedKalmanFilter_Correct_OnlyUYR.vi | | | | | |
| | Χ | X | | X | | | UnscentedKalmanFilter_Correct.vi | | | | | |
| | Χ | Χ | | X | | | UnscentedKalmanFilter_GetP_Single.vi | | | | | |
| | X | Χ | | X | | | UnscentedKalmanFilter_GetP.vi | | | | | |
| | X | X | | X | | | UnscentedKalmanFilter_GetXHat_Single.vi | | | | | |
| | X | Χ | | X | | | UnscentedKalmanFilter_GetXHat.vi | | | | | |
| | X | Χ | | X | | | UnscentedKalmanFilter_New_Default.vi | | | | | |
| | X | X | | X | | | UnscentedKalmanFilter_New_FuncGroup.vi | | | | | |
| | Χ | Χ | | X | | | UnscentedKalmanFilter_New.vi | | | | | |
| | Χ | Χ | | X | | | UnscentedKalmanFilter_Predict.vi | | | | | |
| | Χ | X | | X | | | UnscentedKalmanFilter_Reset.vi | | | | | |
| | Χ | Χ | | X | | | UnscentedKalmanFilter_SetP.vi | | | | | |
| | Χ | Χ | | X | | | UnscentedKalmanFilter_SetXHat_Single.vi | | | | | |
| | Χ | X | | X | | | UnscentedKalmanFilter_SetXHat.vi | | | | | |
| | Χ | X | | X | | | UnscentedKalmanFilter_Transform.vi | | | | | |
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'======== STATE SPACE CONTROL '=======

| CONTROL AFFINE PLANT INVERSION FEEDFORWARD | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
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| DIFFERENTIAL DRIVE ACCELERATION LIMITER | X X Implemented | X X Documented | Not WPILIB | X X Menu Item | Execution Optimized | X X Test Routine | | VI Name DiffDrvAccelLimit_Calculate.vi DiffDrvAccelLimit_New.vi | Function Prototype | Notes | Code Review | Test Program | Error Checking |

| Revision 2.X | 11/06/2022 – added various routines |
|--------------|-------------------------------------|
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| routines | | | | | |
|---------------|---|---|---|-----|----------------------------|
| LINEAR SYSTEM | X | X | Χ | - 1 | LinearSystem_CalculateX.vi |

| EM | X | X | X | - 1 | LinearSystem_CalculateX.vi | | |
|----|---|---|---|-----|--|--|--|
| | X | Χ | X | - 1 | LinearSystem_CalculateY.vi | | |
| | X | X | X | SI | LinearSystem_GetA.vi | | |
| | X | X | X | SI | LinearSystem_GetAElement.vi | | |
| | X | X | X | SI | LinearSystem_GetB.vi | | |
| | X | X | X | SI | LinearSystem_GetBElement.vi | | |
| | X | Χ | X | SI | LinearSystem_GetC.vi | | |
| | X | X | X | SI | LinearSystem_GetCElement.vi | | |
| | X | X | X | SI | LinearSystem_GetD.vi | | |
| | X | X | X | SI | LinearSystem_GetD.vi LinearSystem_GetDElement.vi | | |
| | X | Χ | X | SI | LinearSystem_New.vi | | |
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| LINEAR SYSTEM LOOP | Χ | X | | X | | | | LinearSystemLoop_ClampInput.vi | | | | | |
| | Χ | X | | X | | | | LinearSystemLoop_Correct.vi | | | | | |
| | | | | | | | | LinearSystemLoop_GetClampFunction.vi | | | | | |
| | X | X | | X | | | | LinearSystemLoop_GetController.vi | | | | | |
| | Χ | X | | X | | | | LinearSystemLoop_GetError_Single.vi | | | | | |
| | Χ | X | | X | | | | LinearSystemLoop_GetError.vi | | | | | |
| | Χ | Χ | | X | | | | LinearSystemLoop_GetFeedForward.vi | | | | | |
| | Χ | Χ | | X | | | | LinearSystemLoop_GetNextR_Single.vi | | | | | |
| | Χ | Χ | | X | | | | LinearSystemLoop_GetNextR.vi | | | | | |
| | Χ | Χ | | X | | | | LinearSystemLoop GetObserver.vi | | | | | |
| | Χ | Χ | | X | | | | LinearSystemLoop_GetU_Row.vi | | | | | |
| | Χ | Χ | | X | | | | LinearSystemLoop_GetU.vi | | | | | |
| | Χ | Χ | | X | | | | LinearSystemLoop_GetXHat_Single.vi | | | | | |
| | Χ | Χ | | X | | | | LinearSystemLoop GetXHat.vi | | | | | |
| | | | | | | | | LinearSystemLoop_New_BBB | | | | | |
| | | | | | | | | LinearSystemLoop_New_LinearSystem_ClampFunc | | | | | |
| | Χ | X | | X | | | | LinearSystemLoop New LinearSystem ClampVal.vi | | | | | |
| | Χ | X | | X | | | | LinearSystemLoop New.vi | | | | | |
| | Χ | X | | X | | | | LinearSystemLoop Predict.vi | | | | | |
| | Χ | X | | X | | | | LinearSystemLoop_Reset.vi | | | | | |
| | | | | | | | | LinearSystemLoop_SetClampFunction.vi | | | | | |
| | | | | | | | | LinearSystemLoop SetNextR Some.vi | | | | | |
| | Χ | X | | X | | | | LinearSystemLoop SetNextR.vi | | | | | |
| | | | | | | | | LinearSystemLoop SetXHat Single.vi | | | | | |
| | | | | | | | | LinearSystemLoop_SetXHat.vi | | | | | |
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LTV DIFFERENTIAL DRIVE CONTROLLE

| | Implen | Docum | Not WI | Menu I | Execut | Test R | Sampli | VI Name | Function Prototype | Notes | Code F | Test P | Error C |
|-----|--------|-------|--------|--------|--------|--------|--------|--|--------------------|-------|--------|--------|---------|
| LER | Χ | Χ | | Χ | | | | LTVDiffDriveCtrl_Calculate.vi | | | | | |
| | Χ | Χ | | Χ | | | | LTVDiffDriveCtrl_New.vi | | | | | |
| | Χ | Χ | | Χ | | | | LTVDiffDriveCtrl_Calculate_TrajState.vi | | | | | |
| | Χ | X | | Χ | | | | LTVDiffDriveCtrl_Calculate_SetTolerance.vi | | | | | |
| | Χ | Χ | | Χ | | | | LTVDiffDriveCtrl_Calculate_AtReference.vi | | | | | |
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| added various routines | | | | | | | | | | | | |
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| LTV UNICYCLE CONTROLLER | Χ | Χ | | Χ | | Χ | LTVUnicycleCtrl_AtReference.vi | | | | | |
| | Χ | Χ | | Χ | | Χ | LTVUnicycleCtrl_Calculate_TrajState.vi | | | | | |
| | Χ | Χ | | Χ | | Χ | LTVUnicycleCtrl_Calculate.vi | | | | | |
| | Χ | X | | Χ | | Χ | LTVUnicycleCtrl_New.vi | | | | | |
| | Χ | X | | Χ | | Χ | LTVUnicycleCtrl_SetEnabled.vi | | | | | |
| | Χ | X | | Χ | | Χ | LTVUnicycleCtrl_SetTolerance.vi | | | | | |
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'========= STATE SPACE UTILITIES '======

| | Implemented | Documented | | Execution Optimized | Test Routine | Sample Program | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
|-----------------|---|---------------------------------------|-----|---------------------|--------------|----------------|---|--------------------|------------------|-------------|--------------|----------------|
| ALLBACK HELPER | X | X | | (| | | CallbackHelp_MatrixMinus.vi | | | | ' | |
| | X | X | | | | | CallbackHelp_MatrixMult_CoerceSizeB.vi | | | | · ' | |
| | X | X | | | | | CallbackHelp_MatrixMult.vi | | | | | |
| | X | X | () | (| | | CallbackHelp_MatrixPlus.vi | | | | | |
| _ | | Documented Not Mail IB | | | | Sample Program | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| DISCRETIZATION | | X | | (| X | | Discretization_DiscretizeA.vi | | | | <u> </u> | |
| | | X | | (| X | | Discretization_DiscretizeAB.vi | | | | <u> </u> | |
| | | Χ | | (| X | | Discretization_DiscretizeABTaylor.vi | | | | ' | |
| | | X | | (| X | | Discretization_DiscretizeAQ.vi | | | | <u> </u> | |
| | | X | | (| Χ | | Discretization_DiscretizeAQTaylor.vi | | | | <u> </u> | |
| | X | X | | (| | | Discretization_DiscretizeR.vi | | | | ' | |
| | ted | nented c | | Execution Optimized | Test Routine | ole Program | | | | Code Review | Test Program | Fror Checking |
| | Implemented | Documented Not Well to | | | Test F | Sample | VI Name | Function Prototype | Notes | U U | | |
| TATE SPACE UTIL | X | X | () | 0 | Test F | Sam | StateSpaceUtil_Check_Stabalizable.vi | Function Prototype | Internal routine | S . | | |
| TATE SPACE UTIL | X | X X | () | 0 | Test F | Sam | StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi | Function Prototype | | O | | |
| TATE SPACE UTIL | X X X | X X X X | (N | 0 | Test F | Samı | StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi StateSpaceUtil_IsDetectable.vi | Function Prototype | Internal routine | O | | |
| TATE SPACE UTIL | X X X | X X X X X | (N | | | | StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi StateSpaceUtil_IsDetectable.vi StateSpaceUtil IsStabalizable.vi | Function Prototype | Internal routine | O | | |
| TATE SPACE UTIL | X X X X | X X X X X X | | | X | | StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi StateSpaceUtil_IsDetectable.vi StateSpaceUtil_IsStabalizable.vi StateSpaceUtil_MakeCostMatrix.vi | Function Prototype | Internal routine | O | | |
| TATE SPACE UTIL | X X X X X | X X X X X X X | | | | | StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi StateSpaceUtil_IsDetectable.vi StateSpaceUtil_IsStabalizable.vi StateSpaceUtil_MakeCostMatrix.vi StateSpaceUtil_MakeCovarianceMatrix.vi | Function Prototype | Internal routine | O | | |
| TATE SPACE UTIL | X X X X X X | X X X X X X X X X X X X X X X X X X X | | | X | | StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi StateSpaceUtil_IsDetectable.vi StateSpaceUtil_IsStabalizable.vi StateSpaceUtil_MakeCostMatrix.vi StateSpaceUtil_MakeCovarianceMatrix.vi StateSpaceUtil_MakeWhiteNoiseVector.vi | Function Prototype | Internal routine | O | | |
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| TATE SPACE UTIL | X X X X X X X | X X X X X X X X X X X X X X X X X X X | | | X | | StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi StateSpaceUtil_IsDetectable.vi StateSpaceUtil_IsStabalizable.vi StateSpaceUtil_MakeCostMatrix.vi StateSpaceUtil_MakeCovarianceMatrix.vi StateSpaceUtil_MakeWhiteNoiseVector.vi StateSpaceUtil_NomalizeInputVector.vi StateSpaceUtil_PoseTo3dVector.vi | Function Prototype | Internal routine | O | | |
| TATE SPACE UTIL | X X X X X X X X X | X X X X X X X X X X X X X X X X X X X | | | X | | StateSpaceUtil_Check_Stabalizable.vi StateSpaceUtil_ClampInputMaxMagnitude.vi StateSpaceUtil_IsDetectable.vi StateSpaceUtil_IsStabalizable.vi StateSpaceUtil_MakeCostMatrix.vi StateSpaceUtil_MakeCovarianceMatrix.vi StateSpaceUtil_MakeWhiteNoiseVector.vi StateSpaceUtil_NomalizeInputVector.vi | Function Prototype | Internal routine | O | | |

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| BATTERY SIN | | Χ | | X | SI | | BatterySim_CalculateDefaultBatteryLoadedVoltage.vi | | | | | |
| | X | X | | X | SI | | BatterySim_CalculateLoadedVoltage.vi | | | | | |
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| DC MOTOR SIN | | | 2 - | | <u>ш</u> <u>г</u> | | DCMotorSim_getAngularPositionRad.vi | Function Prototype | Notes | O | <u> </u> | Ш |
| DC WICHOR SIN | | X | | X X | | | DCMotorSim_getAngularPositionRad.vi | | | | | |
| | | X | | X | | + | DCMotorSim_getAngularVelocityRadPerSec.vi | | | | | |
| | | \hat{X} | | X | | + | DCMotorSim_getAngularVelocityRPM.vi | | | | | |
| | | X | | X | | + | DCMotorSim_GetCurrentDrawAmps.vi | | | | | |
| | | X | | × | | | DCMotorSim New MOI.vi | | | | | |
| | | Χ | | X | | | DCMotorSim_New_Plant.vi | | | | | |
| | X | Χ | | X | | | DCMotorSim_SetInputVoltage.vi | | | | | |
| | X | Χ |) | X | | | DCMotorSim_Update.vi | | | | | |
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| DIFFERENTIAL DRIVE TRAIN SIN | 1 X | Χ | , | Y | Execution Optimized Test Routine | O Drawes | VI Name DiffDriveTrainSim_ClampInput.vi | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| DIFFERENTIAL DRIVE TRAIN SIM | A X | X X | , j | X X | Execution Optimized Test Routine | merand olumes | VI Name DiffDriveTrainSim_ClampInput.vi DiffDriveTrainSim_CreateKitbotSim_EstMass.vi | Function Prototype | Notes | Code Review | Test Program | Error Checking |
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| X | XX | No | | LinearSystemSim_UpdateY.vi | | | |

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| SINGLE JOINT ARM SIM | | Χ | | Χ | | | | SngJntArmSim_EsitmateMOI.vi | | | | | |
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| | Χ | Χ | | Χ | | | | SngJntArmSim_GetVelocityRadsPerSec.vi | | | | | |
| | Χ | Χ | | Χ | | | | SngJntArmSim_HasHitLowerLimit.vi | | | | | |
| | Χ | Χ | | Χ | | | | SngJntArmSim_HasHitUpperLimit.vi | | | | | |
| | Χ | Χ | | Χ | | | | SngJntArmSim_New.vi | | | | | |
| | Χ | Χ | | No | | | | SngJntArmSim_Rkf45_Func.vi | | | | | |
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| | Χ | Χ | | Χ | | | | SngJntArmSim_SetState.vi | | | | | |
| | Χ | Χ | | Χ | | | | SngJntArmSim_Update.vi | | | | | |
| | Χ | Χ | | Χ | | | | SngJntArmSim_UpdateX.vi | | | | | |
| | Χ | Χ | | Χ | | | | SngJntArmSim_WouldHitLowerLimit.vi | | | | | |
| | Χ | Χ | | Χ | | | | SngJntArmSim_WouldHitUpperLimit.vi | | | | | |
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'======== MATRIX UTILITIES

> Function Prototype Notes MatBuilder_Create.vi
> MatBuilder_Fill.vi MAT BUILDER X X X SI X SI XX

| | . Implemented | . Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
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| MATRIX | X | X | | X | SI | | | Matrix_AssignBlock.vi | | | | | |
| | Χ | X | | X | SI | | | Matrix_Block.vi | | | | | |
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| | X | X | | X | SI | | | Matrix_Create.vi | | | | | |
| | | | | | | | | Matrix_Det.vi | | | | | |
| | Χ | X | | X | SI | | | Matrix_Diag.vi | | | | | |
| | | | | | | | | Matrix_Div_Scalar.vi | | labview has function | | | |
| | | | | | | | | Matrix_ElementPower.vi | | | | | |
| | X | X | | X | SI | | | Matrix_ElementSum.vi | | | | | |
| | | | | | | | | Matrix_ElementTimes.vi | | | | | |
| | | | | | | | | Matrix_Equals.vi | | | | | |
| | Χ | X | | X | 1 | | | Matrix_Exp.vi | | | | | |
| | Χ | X | | X | SI | | | Matrix_ExtractColumnVector.vi | | | | | |
| | Χ | X | | X | SI | | | Matrix_ExtractFrom.vi | | | | | |
| | | | | | | | | Matrix_ExtractMatrix.vi | | | | | |
| | Χ | Χ | | X | SI | | | Matrix_ExtractRowVector.vi | | | | | |
| | Χ | Χ | | X | SI | | | Matrix_Fill.vi | | | | | |
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| | | | | | | | Matrix_Plus_Scalar.vi | | | | | |
| | X | X | | X | 1 | | Matrix Pow.vi | | THIS NEEDS WORK!!!! | | | |
| | X | X | | X | SI | | Matrix_SetColumn.vi | | THIS NEEDS WORKS | | | |
| | X | X | | X | SI | | Matrix_SetRow.vi | THERE ARE LOTS OF OTHER MATRIX FUNCTIONS THAT | | | | |
| | ^ | ^ | | ^ | 31 | | Mainx_Seirow.vi | SHOULD BE INCLUDED HERE FOR ISOLATION. | | | | |
| | | | | | | | Matrix Solve.vi | SHOOLD BE INCLUDED HERE FOR ISOLATION. | | | | |
| | | | | | | | Matrix Times Matrix.vi | | | | | |
| | | | | | | | Matrix_Times_Scalar.vi | | | | | |
| | | | | | | | Matrix Trace.vi | | | | | |
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| | | X | | | Si | | Matrix_Transpose.vi | | | | | |
| | X | X | X | Χ | | | Matrix_WithinTolerance.vi | | | | | |
| | | | | | | | | | | | | |
| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Programme NI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| SIMPLE MATRIX | X | X | | X | SI | | SimpleMatrix_ExtractMatrix.vi | 7. | NOTE Matrix also has an ExtractMatrix with different calling parameters YUK. | 0 | | |
| SIMPLE MATRIX MATRIX HELPER | X Implemented | X Documented | X Not WPILIB | X Menu Item X | ত Execution Optimized | Test Routine | SimpleMatrix_ExtractMatrix.vi | Function Prototype | NOTE Matrix also has an ExtractMatrix with different calling | Code Review | | Error Checking |
| | X X Implemented | X X Documented | X X Not WPILIB | X Menu Item | ଦ୍ର ଓ Execution Optimized | Test Routine | SimpleMatrix_ExtractMatrix.vi | | NOTE Matrix also has an ExtractMatrix with different calling parameters YUK. | Review | | Error Checking |
| | X Implemented | X X Documented | X Not WPILIB | X Menu Item | ଦ୍ର ଓ Execution Optimized | Test Routine | SimpleMatrix_ExtractMatrix.vi | | NOTE Matrix also has an ExtractMatrix with different calling parameters YUK. | Review | | Error Checking |
| | X X Implemented | X X Documented | X X Not WPILIB | X X Menu Item | Optimized 99 99 Execution Optimized | | SimpleMatrix_ExtractMatrix.vi WatrixHelper_CooerceSize.vi MatrixHelper_MultCooerceBSize.vi MatrixHelper_Zero.vi | Function Prototype | NOTE Matrix also has an ExtractMatrix with different calling parameters YUK. Notes | . Code Review | Test Program | Checking |
| MATRIX HELPER | Implemented X X Implemented | Documented X X X Documented | X X Not WPILIB | Menu Item X X Menu Item X | Execution Optimized 99 99 Execution Optimized | Test Routine Test Routine | SimpleMatrix_ExtractMatrix.vi Webbod Work WatrixHelper_CooerceSize.vi MatrixHelper_MultCooerceBSize.vi MatrixHelper_Zero.vi WatrixHelper_Zero.vi | | NOTE Matrix also has an ExtractMatrix with different calling parameters YUK. | Review | | Error |
| | X Implemented X X Implemented | X Documented X X X Documented | X X Not WPILIB | X Menu Item X X Menu Item X X X Menu Item X X X X X X X X X | 2 Execution Optimized 2 2 2 Execution Optimized | | SimpleMatrix_ExtractMatrix.vi Webboy VI Name MatrixHelper_CooerceSize.vi MatrixHelper_MultCooerceBSize.vi MatrixHelper_Zero.vi WatrixHelper_Zero.vi VI Name VecBuilder_1x1Fill.vi | Function Prototype | NOTE Matrix also has an ExtractMatrix with different calling parameters YUK. Notes | . Code Review | Test Program | Checking |
| MATRIX HELPER | X X Implemented X X Implemented | X X Documented | X X Not WPILIB | X Menu Item X X Menu Item X X | \Omega Execution Optimized \Omega \Omega Execution Optimized | | SimpleMatrix_ExtractMatrix.vi WatrixHelper_CooerceSize.vi MatrixHelper_MultCooerceBSize.vi MatrixHelper_Zero.vi WatrixHelper_Zero.vi Working VI Name VecBuilder_1x1Fill.vi VecBuilder_2x1Fill.vi | Function Prototype | NOTE Matrix also has an ExtractMatrix with different calling parameters YUK. Notes | . Code Review | Test Program | Checking |
| MATRIX HELPER | X X Implemented X X Implemented | X X X Documented | X X Not WPILIB | X X Menu Item X X X Menu Item X | 12 12 12 Execution Optimized 13 12 12 Execution Optimized | | SimpleMatrix_ExtractMatrix.vi WatrixHelper_CooerceSize.vi MatrixHelper_MultCooerceBSize.vi MatrixHelper_Zero.vi WatrixHelper_Zero.vi Worship MatrixHelper_Zero.vi | Function Prototype | NOTE Matrix also has an ExtractMatrix with different calling parameters YUK. Notes | . Code Review | Test Program | Checking |
| MATRIX HELPER | X X Implemented X X Implemented | X X X Documented | X X Not WPILIB | X X Menu Item X X X Menu Item X | 12 < | | SimpleMatrix_ExtractMatrix.vi WecBuilder_3x1Fill.vi VecBuilder_4x1Fill.vi VecBuilder_4x1Fill.vi VecBuilder_4x1Fill.vi VecBuilder_4x1Fill.vi VecBuilder_4x1Fill.vi | Function Prototype | NOTE Matrix also has an ExtractMatrix with different calling parameters YUK. Notes | . Code Review | Test Program | Checking |
| MATRIX HELPER | X X X Implemented | X X X Documented X X X Documented | X X Not WPILIB | X X X Menu Item X X X X | 12 < | | SimpleMatrix_ExtractMatrix.vi ### SimpleMatrix_ExtractMatrix.vi ### Williams ### Williams ### Williams ### Williams ### Vil Name ### VecBuilder_1x1Fill.vi ### VecBuilder_2x1Fill.vi ### VecBuilder_3x1Fill.vi ### VecBuilder_4x1Fill.vi ### VecBuilder_5x1Fill.vi ### VecBuilder_5x1Fill.vi #### VecBuilder_5x1Fill.vi #### VecBuilder_5x1Fill.vi #### VecBuilder_5x1Fill.vi #### VecBuilder_5x1Fill.vi ##### VecBuilder_5x1Fill.vi ################################### | Function Prototype | NOTE Matrix also has an ExtractMatrix with different calling parameters YUK. Notes | . Code Review | Test Program | Checking |
| MATRIX HELPER | X X Implemented X X Implemented | X X X Documented | X X Not WPILIB | X X Menu Item X X X Menu Item X | 12 < | | SimpleMatrix_ExtractMatrix.vi WecBuilder_3x1Fill.vi VecBuilder_4x1Fill.vi VecBuilder_4x1Fill.vi VecBuilder_4x1Fill.vi VecBuilder_4x1Fill.vi VecBuilder_4x1Fill.vi | Function Prototype | NOTE Matrix also has an ExtractMatrix with different calling parameters YUK. Notes | . Code Review | Test Program | Checking |

| X | X | | X SI | VecBuilder_8x1Fill.vi | | | |
|---|---|---|------|----------------------------|--|--|--|
| | | | | VecBuilder_9x1Fill.vi | | | |
| | | | | VecBuilder_10x1Fill.vi | | | |
| X | X | X | X SI | VecBuilder_ArrayBy1Fill.vi | | | |
| | | | | | | | |

| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine Sample Program | VI Name | Function Prototype | Notes | Code Review | Test Program | Error Checking |
|--------|-------------|------------|------------|-----------|---------------------|--------------------------------|----------------|--------------------|-------|-------------|--------------|----------------|
| VECTOR | Χ | X | | X | SI | | Vector_Dot.vi | | | | | |
| | Χ | X | | Χ | Si | | Vector_Norm.vi | | | | | |
| | | | | | | | | | | | | |

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MATH '======

| ANGLE STATISTICS | | X Documented | X Not WPILIB | X Menu Item | | Test Routine | EB DO | Function Prototype | Notes | Code Review | Test Program | Error Checking |
|---------------------------|-----------------|---------------------------------------|--------------|---------------------------------------|-----------------------|--------------|---|--------------------|-------|-------------|--------------|----------------|
| | X X X | X X X | X | X | X | | AngleStats_AngleAdd.vi AngleStats_AngleMean_CallbackHelp.vi AngleStats_AngleMean.vi | | | | | |
| | X | X | X | X | X I | X | AngleStats_AngleResidual_CallbackHelp.vi AngleStats_AngleResidual.vi | | | | | |
| MATH UTILITY | X X 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 X X X X X X X X X X X X X X X | SI SI | Test Routine | VI Name MathUtil_AngleModulus.vi MathUtil_ApplyDeadband.vi MathUtil_Clamp_Int.vi MathUtil_Clamp.vi MathUtil_InputModulus.vi MathUtil_Interpolate.vi | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| MERWE SCALED SIGMA POINTS | X Implemented | X Documented | Not WPILIB | X Menu Item | - Execution Optimized | Test Routine | E E E E E E E E E E E E E E E E E E E | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| MENTE COALLY COMA POINTS | Χ | Χ | | X | SI | | MerweScSigPts GetNumSigmas.vi | | | | | |
| | X | X | | X | | _ | MerweScSigPts_GetWc_Single.vi | | | | | |
| | X | X | | X | 51 | 1 | MerweScSigPts_GetWc.vi | | | | | |
| | | X | | X | SI | | MerweScSigPts GetWm Single vi | | | | 1 | 1 |
| | X | X | | X | SI | | MerweScSigPts_GetWm_Single.vi MerweScSigPts_GetWm.vi | | | | | |

| added various routines | | | | | | | | | | | | | |
|--|-----------------|----------------|------------|---------------|---------------------|--------------|----------------|--|--------------------|--|-------------|--------------|----------------|
| | X | X | | Χ | 1 | | | MerweScSigPts_New.vi | | | | | |
| | Χ | Χ | | X | 1 | | | MerweScSigPts_SigmaPoints.vi | | | | | |
| | | | | | | | | | | | | | |
| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Sample Program | | | | Review | Test Program | Error Checking |
| | gle | noc | 7 7 | ent | GC | st | шt | | | | Code | st | 70. |
| | | | ž | Ž | | | Sa | VI Name | Function Prototype | Notes | ပ | | Ţ |
| NUMERICAL INTEGRATION | X | X | | $\mid x \mid$ | 1 | | | NumIntegrate_Func_Ax_Bu_K.vi | | NOT USED. Should this be used or abandoned??? | | | |
| | X | Χ | | X | | | | NumIntegrate_Rk4_Dbl_X_U.vi | | | | | |
| | X | Χ | | Χ | | | | NumIntegrate_Rk4_Dbl_X.vi | | | | | |
| | X | Χ | | Χ | | | | NumIntegrate_Rk4_Mat_X_U.vi | | | | | |
| | X | Χ | | Χ | | | | NumIntegrate_Rk4_Mat_X.vi | | | | | |
| | X | Χ | | No | | | | NumIntegrate_Rkdp_Func_A.vi | | | | | |
| | X | Χ | | No | SI | | | NumIntegrate_Rkdp_Func_B1.vi | | | | | |
| | X | X | | No | SI | | | NumIntegrate_Rkdp_Func_B1B2.vi | | | | | |
| | Χ | Χ | | No | SI | | | NumIntegrate_Rkdp_Func_B2.vi | | | | | |
| | X | Χ | | No | 1 | | | Numintegrate_Rkdp_Impl.vi | | | | | |
| | X | Χ | | X | | | | NumIntegrate_RKDP_Mat_X_U.vi | | New replacement for RKF45 | | | |
| | Χ | Χ | | No | SI | | | NumIntegrate_Rkf45_Func_A.vi | | | | | |
| | Χ | Χ | | No | SI | | | NumIntegrate_Rkf45_Func_B1.vi | | | | | |
| | Χ | Χ | | No | SI | | | NumIntegrate_Rkf45_Func_B1B2.vi | | | | | |
| | X | Χ | | No | SI | | | NumIntegrate_Rkf45_Func_B2.vi | | | | | |
| | | | | | | | | NumIntegrate_RKf45_Func_Bs.vi | | Removed. Replaced with newer functions. | | | |
| | | | | | | | | NumIntegrate_RKf45_Func_Ch.vi | | Removed. Replaced with newer functions. | | | |
| | | | | | | | | NumIntegrate_RKf45_Func_Ct.vi | | Removed. Replaced with newer functions. | | | |
| | X | X | | No X | ı | | | NumIntegrate_Rkf45_Impl.vi NumIntegrate_Rkf45_Mat_X_U.vi | | Note that this Feinberg method has been changed and a Dormand Price method has been implemented TODO | | | |
| | | | | | | | | NumIntegrate_RKf45_New.vi | | Removed. Never used. | | | |
| | X | X | X | X | SI | | | NumIntegrate_Trap_Dbl.vi | | | | | |
| | Χ | Χ | Χ | Χ | 1 | | | NumIntegrate_Trap_Mat.vi | | | | | |
| | | | | | o o | | | | | | | | |
| RUNGE KUTTA TIME VARYING | X Implemented | X Documented | Not WPILIB | S Menu Item | Execution Optimized | Test Routine | Sample Program | VI Name RungeKuttaTimeVarying_RK4_Mat_T_Y.vi | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| NUMERICAL JACOBIAN | X X Implemented | X X Documented | Not WPILIB | X Menu Item | Execution Optimized | Test Routine | | VI Name NumJacobian_U.vi NumJacobian_X.vi | Function Prototype | Notes | Code Review | Test Program | Error Checking |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimized | Test Routine | Nample Program | Function Prototype | Notes | Code Review | Test Program | Error Checking |
|---------|-------------|------------|------------|-----------|---------------------|--------------|--------------------------------|--------------------|--|-------------|--------------|----------------|
| RICCATI | Χ | Χ | | Χ | | | Riccati_Check_Detectable.vi | | Routine exists, it is just a shell | | | |
| | Χ | Χ | | Χ | | | Riccati_Check_Stabilizable.vi | | Not really done !!! | | | |
| | | | | | | | Riccati_DARE_Choose.vi | | Intended to allow DARE method testing. | | | |
| | Χ | Χ | Χ | Χ | | Χ | Riccati_DARE_Iterate.vi | | | | | |
| | Χ | Χ | Χ | Χ | | Χ | Riccati_DARE_StructDoubling.vi | | | | | |
| | Χ | Χ | | Χ | | | Riccati_DARE_N.vi | | | | | |
| | Χ | Χ | | Χ | | Χ | Riccati_DARE.vi | | | | | |
| | X | X | | Χ | | | Riccati Input Check.vi | | | | | |

'======= VISION

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Function Prototype Notes COMPUTER VISION UTILITIES X X CompVisionUtil_CalculateDistanceToTarget.vi CompVisionUtil_EstimateCameraToTarget.vi CompVisionUtil_EstimateFieldToCamera.vi X X X X X X X X X X X X Χ X CompVisionUtil_EstimateFieldToRobot.vi Χ Χ CompVisionUtil_EstimateFieldToRobot_Alt.vi

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

| | Implemented | Documented | Not WPILIB | Menu Item | Execution Optimize | Test Routine | Sample Program | VI Name | Function Prototype | Notes |
|---------|-------------|------------|------------|-----------|--------------------|--------------|----------------|--|--------------------|--|
| TypeDef | Ζ | Ζ | X | Χ | N/A | | | ARM_FF.CTL | | |
| | Ζ | Ζ | X | Χ | N/A | | | BANG_BANG.CTL | | |
| | 1 | | X | Х | N/A | | | BICon-Matrix_FUNC_TYPE.CTL | | NOT USED. Should this be deleted or abandoned??? |
| | Ζ | Ζ | Χ | Χ | N/A | | | CALLBACK_FUNC_TYPE.CTL | | |
| | Ζ | Ζ | X | Χ | N/A | | | CHASSIS_SPEEDS.CTL | | |
| | Ζ | Ζ | X | Χ | N/A | | | CONTRAINED_STATE.CTL | | |
| | Z | Ζ | X | Χ | N/A | | | COORDINATE_AXIS.CTL | | |
| | Ζ | Ζ | Χ | Χ | N/A | | | COORDINATE_SYSTEM.CTL | | |
| | Ζ | Ζ | Χ | Χ | N/A | | | DCMOTOR_TYPES_ENUM.CTL | | |
| | Ζ | Ζ | Χ | Χ | N/A | | | DCMOTOR.CTL | | |
| | Ζ | Ζ | Χ | Χ | N/A | | | DCMOTOR_SIM.CTL | | |
| | Ζ | Ζ | Χ | Χ | N/A | | | DEBOUNCER_TYPE_ENUM.Ctl | | |
| | Ζ | Ζ | X | Χ | N/A | | | DEBOUNCER.CTL | | |
| | Ζ | Ζ | Χ | Χ | N/A | | | DIFF_DRIVE_ACCEL_LIMIT.CTL | | |
| | Ζ | Ζ | Χ | Χ | N/A | | | DIFF_DRIVE_KINEMATICS.CTL | | |
| | Ζ | Ζ | Χ | Χ | N/A | | | DIFF_DRIVE_Kitbot_WheelSize_ENUM.ctl | | |
| | Ζ | Ζ | Χ | Χ | N/A | | | DiFF_DRIVE_Pose_EST.ctl | | |
| | Ζ | Ζ | Χ | Χ | N/A | | | DIFF_DRIVE_ToughBoxMini_GearChoice_ENUM.ctl | | |
| | Ζ | Ζ | Χ | Χ | N/A | | | DIFF_DRIVE_ToughBoxMini_MotorChoice_ENUM.ctl | | |
| | Ζ | Ζ | Χ | Χ | N/A | | | DIFF_DRIVE_TRAIN_SIM_STATE_ENUM.CTL | | |

| Z | Ζ | X | X | N/A | DIFF_DRIVE_TRAIN_SIM.ctl | |
|-----|-----|---------------------|---------------------|------------|--|----------------------------|
| Z | Ζ | Χ | X | NA | DISPLAY_WAYPOINT.ctl | Was UTIL_WAYPOINT.VI |
| Z | Z | X | X | NA | DISPLAY_WEIGHTED_WAYPOINT.ctl | New V1.5. was |
| | | | | | | UTIL_WEIGHTED_WAYPOINIT.VI |
| Z | Z | X | X | N/A | ELEV FF.CTL | |
| Z | Z | X | X | N/A | ELEVATOR SIM.CTL | |
| Z | Z | X | X | N/A | EXTENDED KALMAN CORRECT FUNC GROUP.CTL | |
| Z | _ | X | X | N/A | EXTENDED KALMAN FILTER.CTL | |
| Z | Z | X | X | N/A | FLYWHEEL SIM.cti | |
| Z | Z | X | X | N/A | FUNCTION GENERATOR.ctl | |
| Z | Z | X | X | N/A | FUNCTION GENERATOR MATRIX.ctl | |
| Z | Ζ | X | X | N/A | HOLONOMIC DRV CTRL.CTL | New 1/26/21 |
| Z | Ζ | Χ | X | N/A | TIME INTERPOLATABLE BOOLEAN.CTL | |
| Z | Ζ | Χ | X | N/A | TIME INTERPOLATABLE DOUBLE.CTL | |
| Z | Ζ | Χ | X | N/A | TIME_INTERPOLATABLE_POSE2D.CTL | |
| Z | Ζ | Χ | X | N/A | TIME_INTERPOLATABLE_ROTATION2D.CTL | |
| Z | Ζ | Χ | X | N/A | KALMAN_FILTER_LATENCY_COMP_FUNC_GROUP.CTL | |
| Z | Ζ | X | X | N/A | KALMAN_FILTER_LATENCY_COMP.CTL | |
| Z | Ζ | X | X | N/A | KALMAN_FILTER.ctl | |
| Z | Z | Χ | X | N/A | LINEAR_FILTER.CTL | |
| Z | Z | X | X | N/A | LINEAR_PLANT_INV_FF.ctl | |
| Z | Ζ | X | X | N/A | LINEAR_QUADRATIC_REGULATOR.ctl | |
| Z | Ζ | X | X | N/A | LINEAR_SYSTEM_LOOP.ctl | |
| Z | Ζ | X | X | N/A | LINEAR_SYSTEM_SIM.ctl | |
| Z | Ζ | X | X | N/A | LINEAR_SYSTEM.ctl | |
| Z | Z | X | X | N/A | LTV_DIFF_DRIVE_CTRL.ctl | |
| Z | Z | X | X | N/A | LTV_DIFF_DRIVE_CTRL_STATE_ENUM.ctl | |
| Z | Z | Χ | Χ | N/A | LTV_UNICYCLE_CONTROLLER.CTL | |
| N/A | | N/A | | N/A | LTV_UNICYCLE_CONTROLLER_INPUT_ENUM.ctl | OBSOLETE - Removed |
| Z | Z | X | X | N/A | LTV_UNICYCLE_CONTROLLER_STATE_ENUM.ctl | |
| Z | Z | X | X | N/A | MECA_DRIVE_KINEMATICS.CTL | |
| Z | Z | X | X | N/A | MECA_DRIVE_ODOMETRY.CTL | |
| Z | Z | X | X | N/A N/A | MECA_DRIVE_POSE_EST.CTL MECA_WHEEL_SPEEDS.CTL | |
| Z | Z | X | X | N/A | MEDIAN FILTER.CTL | |
| Z | Z | X | X | N/A | MERWE SCALED SIGMA PTS.ctl | |
| Z | Z | $\frac{\lambda}{X}$ | $\frac{\lambda}{X}$ | N/A | OBSERVER SNAP LIST ITEM.CTL | |
| Z | Z | X | X | N/A | OBSERVER_SNAP_LIST_ITEM.CTL OBSERVER_SNAPSHOT.CTL | |
| Z | Z | X | X | N/A | PARAM STACK ITEM.CTL | |
| Z | Z | X | X | N/A | PARAM STACK.CTL | |
| Z | Z | X | X | N/A | PID ADV LIMITS.CTL | |
| Z | Z | X | X | N/A | PID ADV TUNING.CTL | |
| Z | Z | | X | | | |
| Z | Z | X | X | N/A | PID ERROR TOLERANCE.CTL | |
| Z | Z | X | X | N/A | PID INPUT LIMITS.CTL | |
| Z | Z | X | X | N/A | PID TUNING.CTL | |
| Z | Z | X | X | N/A | POSE2D.CTL | |
| Z | Z | X | X | N/A | POSE3D.CTL | |
| Z | Z | Χ | X | N/A | POSEwCURVATURE.CTL | |
| Z | Z | X | X | N/A | PROFILED_PID_CONTROLLER.CTL | |
| Z | Z | X | X | N/A | QUATERNION.CTL | |
| Z | Ζ | Χ | X | N/A | RAMSETE_EXE_TUNING.CTL | |
| Z | Ζ | Χ | X | N/A | RAMSETE.CTL | |
| Z | Z | Χ | X | N/A | ROTATION2D.CTL | |
| Z | Z | X | X | N/A | ROTATION3D.CTL | |
| Z | Ζ | X | X | N/A | SIMPLE_MOTOR_FF.CTL | |
| Z | Z | X | X | N/A | SINGLE_JOINT_ARM_SIM.CTL | |
| Z | Z | X | X | N/A | SLEW_RATE_LIMITER.CTL | |
| Z | Z | X | X | N/A | SPLINE_CTRL_VECTOR.CTL | |
| Z | Z | X | X | N/A | SPLINE.CTL | |
| Z | Z | X | X | N/A | SWERVE_DRIVE_KINEMATICS.CTL | |
| Z | Z | X | X | N/A | SWERVE_DRIVE_ODOMETRY_CTL | |
| Z | Z | X | X | N/A | SWERVE_DRIVE_ODOMETRY.CTL | |
| Z | Z | X | X | N/A | SWERVE_DRIVE_Pose_EST.CTL | |
| Z | Z 7 | X | X | N/A | TIMER.CTL | |
| Z | Ζ | X | X | N/A | TRAJ_CONFIG.CTL | |

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| Z | Ζ | X | Χ | N/A | TRAJ_CONSTRAINT_CENTRIPETAL_ACCEL.CTL | |
|-----|---|-----|---|-----|---|------------------------------------|
| Z | Ζ | X | Χ | N/A | TRAJ_CONSTRAINT_DIIF_DRIVE_KINEMATICS.CTL | |
| Z | Ζ | X | Χ | N/A | TRAJ_CONSTRAINT_DIIF_DRIVE_VOLTAGE.CTL | |
| Ζ | Ζ | X | Χ | N/A | TRAJ_CONSTRAINT_ELLIP_REGION.CTL | |
| 1 | | X | | N/A | TRAJ_CONSTRAINT_JERK.CTL | Routine exists, it is just a shell |
| Z | Ζ | X | Χ | N/A | TRAJ_CONSTRAINT_MAX_VELOCITY.CTL | |
| Z | Ζ | X | Χ | N/A | TRAJ_CONSTRAINT_MECA_DRIVE_KINEMATICS.CTL | |
| Z | Ζ | X | X | N/A | TRAJ_CONSTRAINT_MINMAX.CTL | |
| Z | Ζ | X | Χ | N/A | TRAJ_CONSTRAINT_RECT_REGION.CTL | |
| Z | Ζ | X | Χ | N/A | TRAJ_CONSTRAINT_SWERVE_DRIVE_KINEMATICS.CTL | |
| Z | Ζ | X | Χ | N/A | TRAJ_STATE.CTL | |
| Z | Ζ | X | X | N/A | TRAJECTORY_SPLINE_TYPE_ENUM.CTL | |
| Z | Ζ | X | Χ | N/A | TRAJECTORY.CTL | |
| Z | Ζ | X | X | N/A | TRANSFORM2D.CTL | |
| Z | Ζ | X | Χ | N/A | TRANSFORM3D.CTL | |
| Z | Ζ | X | Χ | N/A | TRANSLATION2D.CTL | |
| Z | Ζ | X | Χ | N/A | TRANSLATION3D.CTL | |
| Z | Ζ | X | X | N/A | TRAPEZOID_PROFILE_CONSTRAINT.CTL | |
| Z | Ζ | X | Χ | N/A | TRAPEZOID_PROFILE_STATE.CTL | |
| Z | Ζ | X | Χ | N/A | TRAPEZOID_PROFILE.CTL | |
| Z | Ζ | X | Χ | N/A | TWIST2D.CTL | |
| Z | Ζ | X | Χ | N/A | TWIST3D.CTL | |
| Z | Z | X | Χ | N/A | UNSCENTED_KALMAN_CORRECT_FUNC_GROUP.CTL | |
| Z | Ζ | X | Χ | N/A | UNSCENTED_KALMAN_FILTER.ctl | |
| Z | Ζ | X | Χ | N/A | UNSCENTED_KALMAN_NEW_FUNC_GROUP.CTL | |
| Z | Ζ | X | Χ | N/A | UTIL_PATHFINDER_CONFIG.CTL | |
| N/A | | N/A | | N/A | WAYPOINTS.CTL | Delete – obsolete |
| Z | Ζ | Χ | Χ | NA | WEIGHTED_WAYPOINT.CTL | New V1.5 |
| N/A | | N/A | | N/A | X_Y_HEADINGS.CTL | Delete – obsolete |
| Z | Ζ | Χ | Χ | N/A | X_Y_PAIR.CTL | |

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