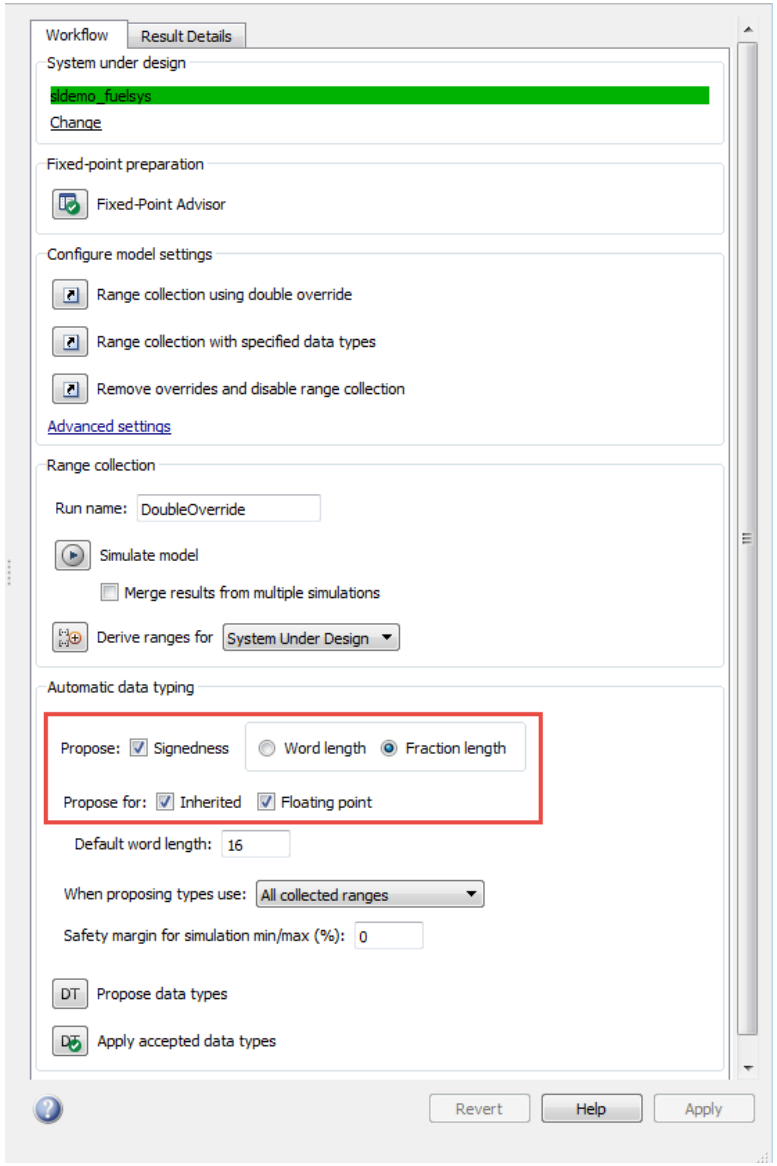
Latest Features in Fixed-Point Designer

September 2015

Simulink Fixed-Point Tool workflow simplification

Propose signedness and data types for inherited and floating-point types

- Propose signedness for blocks in the system under design
- Propose fixed-point data types for objects that use floating-point or inherited data types
- Two-way traceability between Simulink blocks and corresponding results in the Fixed-Point Tool



Double-precision to single-precision conversion

Convert double-precision MATLAB code to single-precision MATLAB code using the command line

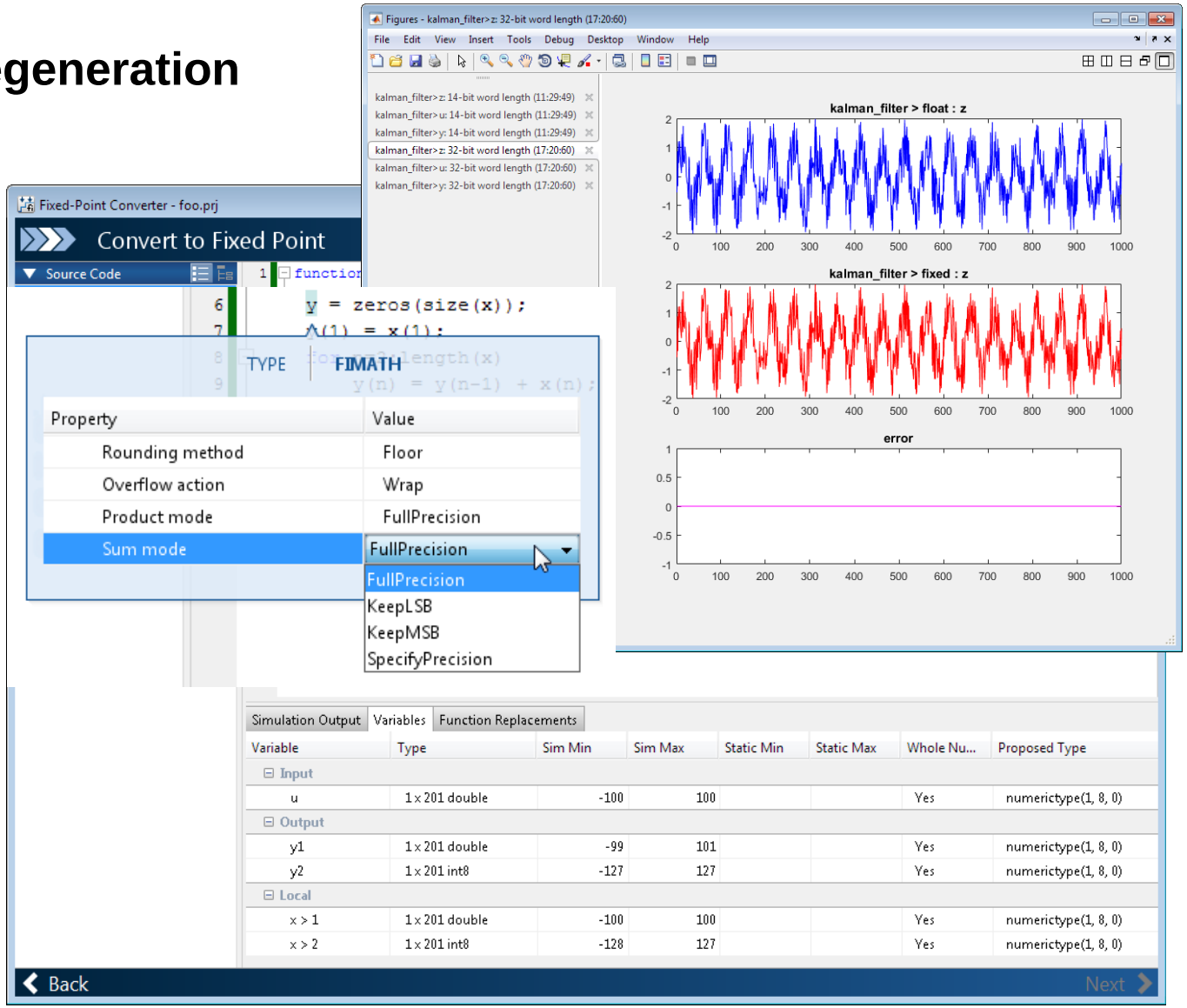
- `convertToSingle` function to convert double-precision MATLAB code to single-precision MATLAB code
- Verify single-precision version without modifying original algorithm
- Using MATLAB Coder, generate single-precision C code using `-singleC` option of `codegen` command

```
%% convertToSingle command
% Create a SingleConfig via coder.config
    singleCfg = coder.config('single');

% Configure SingleConfig
    singleCfg.TestBenchName = 'test_heart_rate_detector';
    singleCfg.TestNumerics = true;
    singleCfg.LogIOForComparisonPlotting = true;

% Pass it to convertToSingle command
    convertToSingle -args {0, true} heart_rate_detector -
config singleCfg

%% -singleC codegen option
% Specify -singleC to codegen along with other options
    libCfg = coder.config('lib');
    libCfg.TargetLangStandard = 'C99 (ISO)';
    codegen -args {0, true} heart_rate_detector -report -
singleC -config libCfg
```

MATLAB Fixed-Point Converter app streamlined workflow

Restore project state and minimize regeneration of MEX files

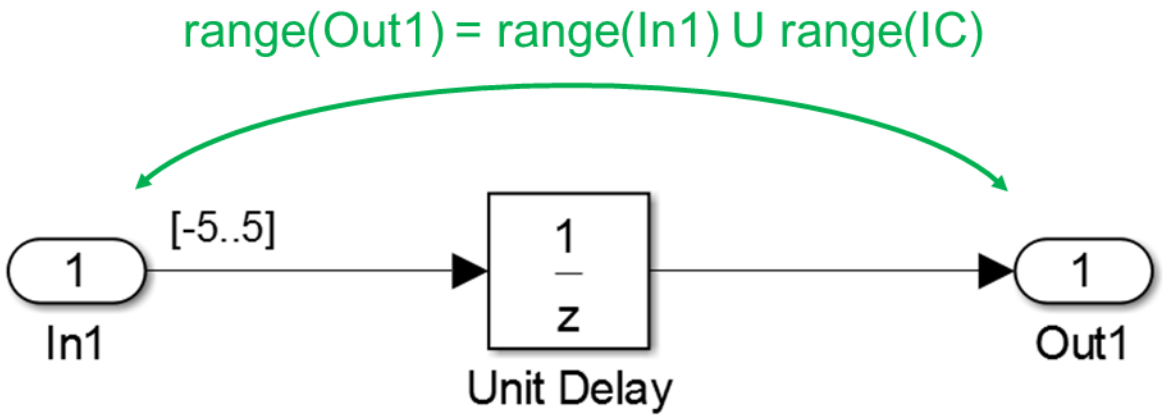
- Save state of project between sessions
- Rebuild MEX files only when required by changes in the code
- Control `fimath` properties within Fixed-Point Converter app editor
- Improved management of comparison plots by docking generated test plots into separate tabs of one figure window
- View variable specializations in the Variables table of the app



Range analysis for Delay blocks

Improve accuracy and speed of range analysis on models using Delay blocks

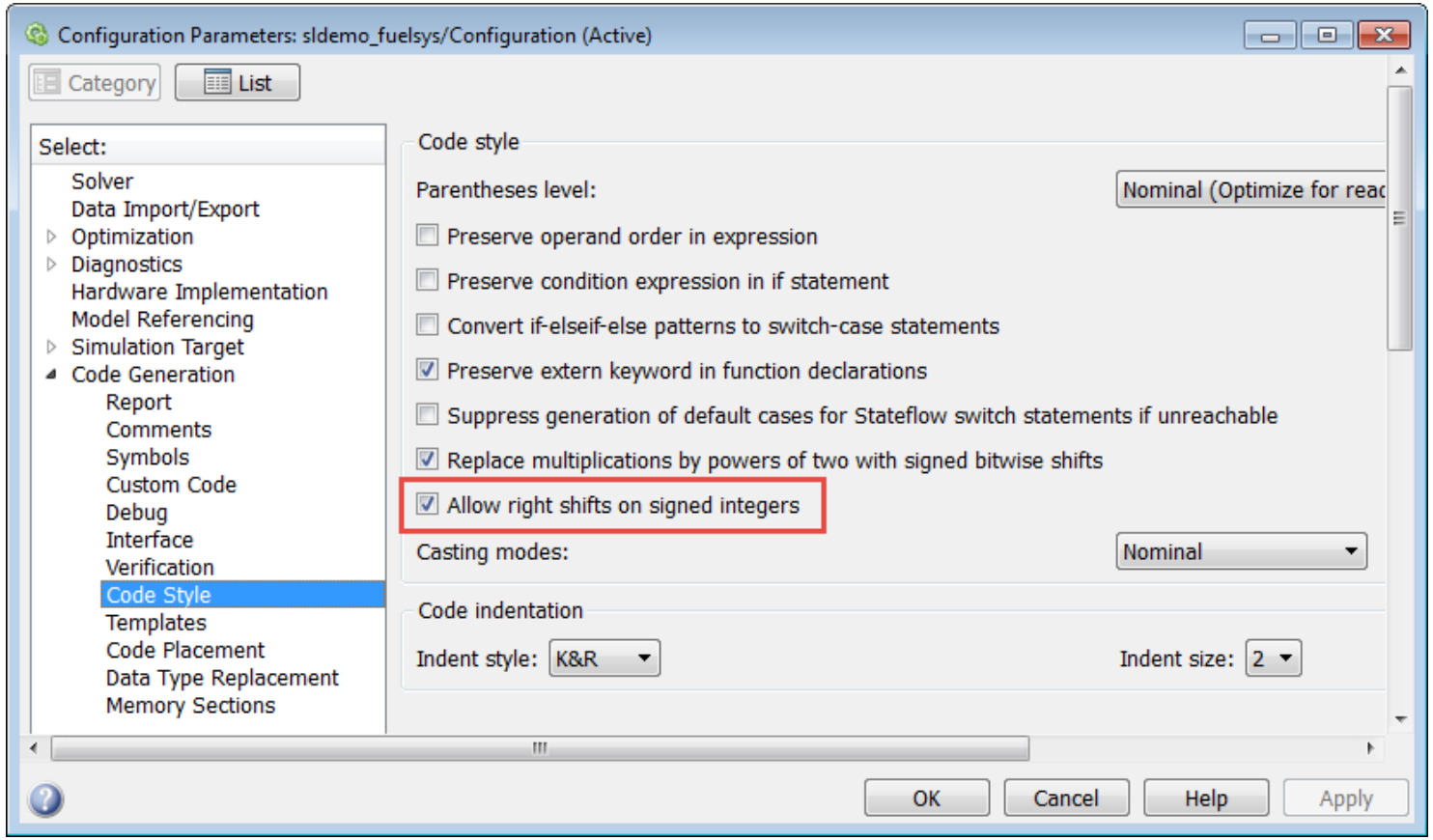
- Derive ranges with greater precision for models that use Delay blocks
- Precise output range for all Delay blocks with bounded input range
- Greater theoretical accuracy and speed in deriving ranges for certain configurations of cascading Delay blocks



Control of signed shifts in fixed-point scaling operations

Control the use of signed shifts in generated code

- Replace signed shifts with a function call that performs the operation without the use of signed shifts
- Assist in compliance with certain coding standards (e.g., MISRA)



Full-precision value property for fi object

Easy access to exact values in decimal and "to string" methods for fi object

- Set and get full-precision fixed-point values in "real-world value"
- Use `tostring` for fi objects to enable cut-and-paste into MATLAB function
- Use `mat2str` "matrix to string" for fi objects to display full precision without going through double

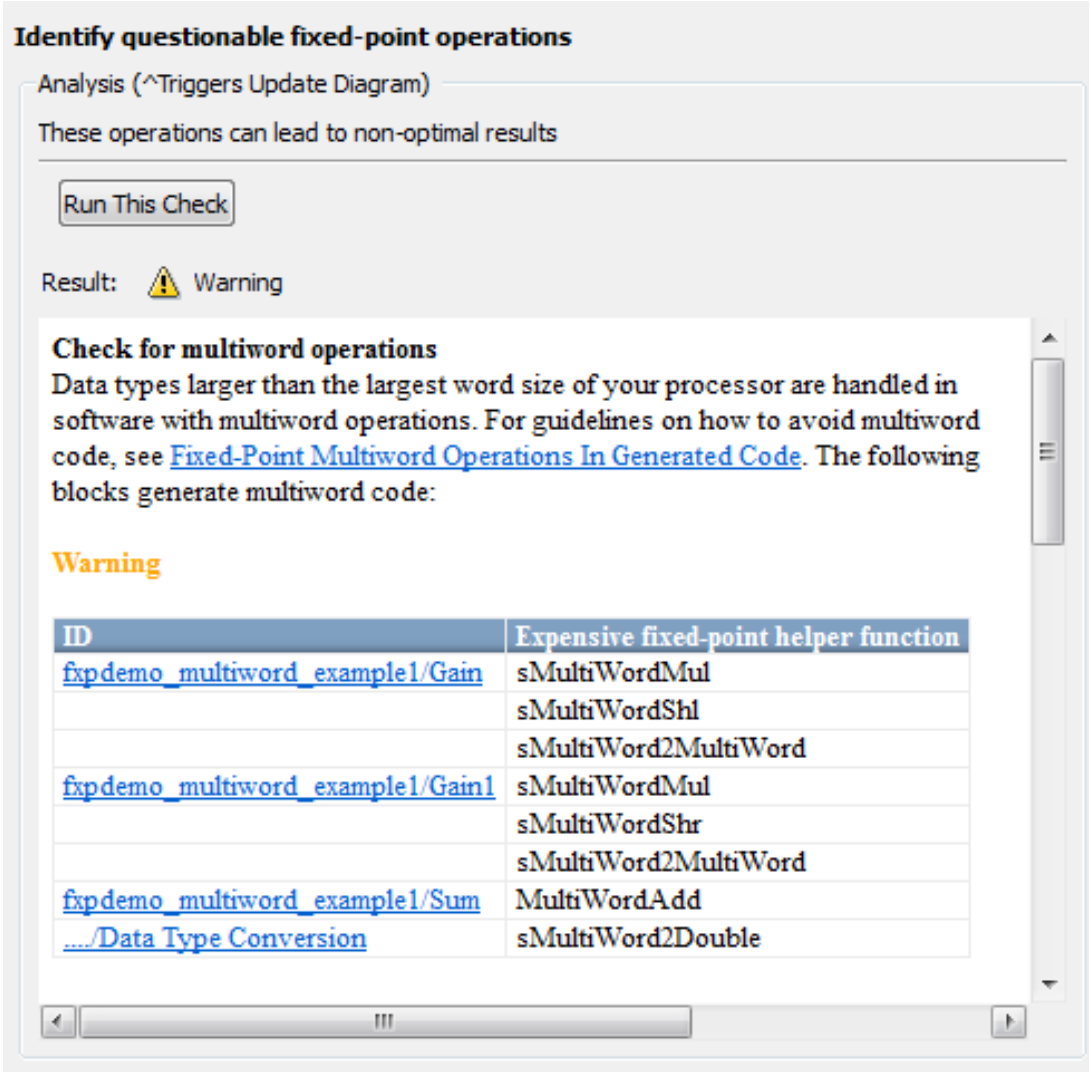
Command Window

```
>> X = fi([],1,128,127);
>> X.Value = '[0.25, 0.1]'

X =

    0.2500    0.1000

          DataTypeMode: Fixed-point: binary point scaling
            Signedness: Signed
            WordLength: 128
        FractionLength: 127
>> X.Value

ans =

[0.25 0.10000000000000000000000000000000000001175494350822287507968736537222245677818665556772087521

>> tostring(X)

ans =

fi('numerictype',numerictype(1,128,127),'Value','[0.25 0.10000000000000000000000000000000000012]')

>> mat2str(X)

ans =

[0.25 0.10000000000000000000000000000000000012]

>> mat2str(X,'class')

ans =

fi('numerictype',numerictype(1,128,127),'Value','[0.25 0.10000000000000000000000000000000000012]')

>> mat2str(X,4,'class')

ans =

fi('numerictype',numerictype(1,128,127),'Value','[0.25 0.1]')
```

Detection of multiword operations for Simulink models

Detect multiword operations using Model Advisor checks

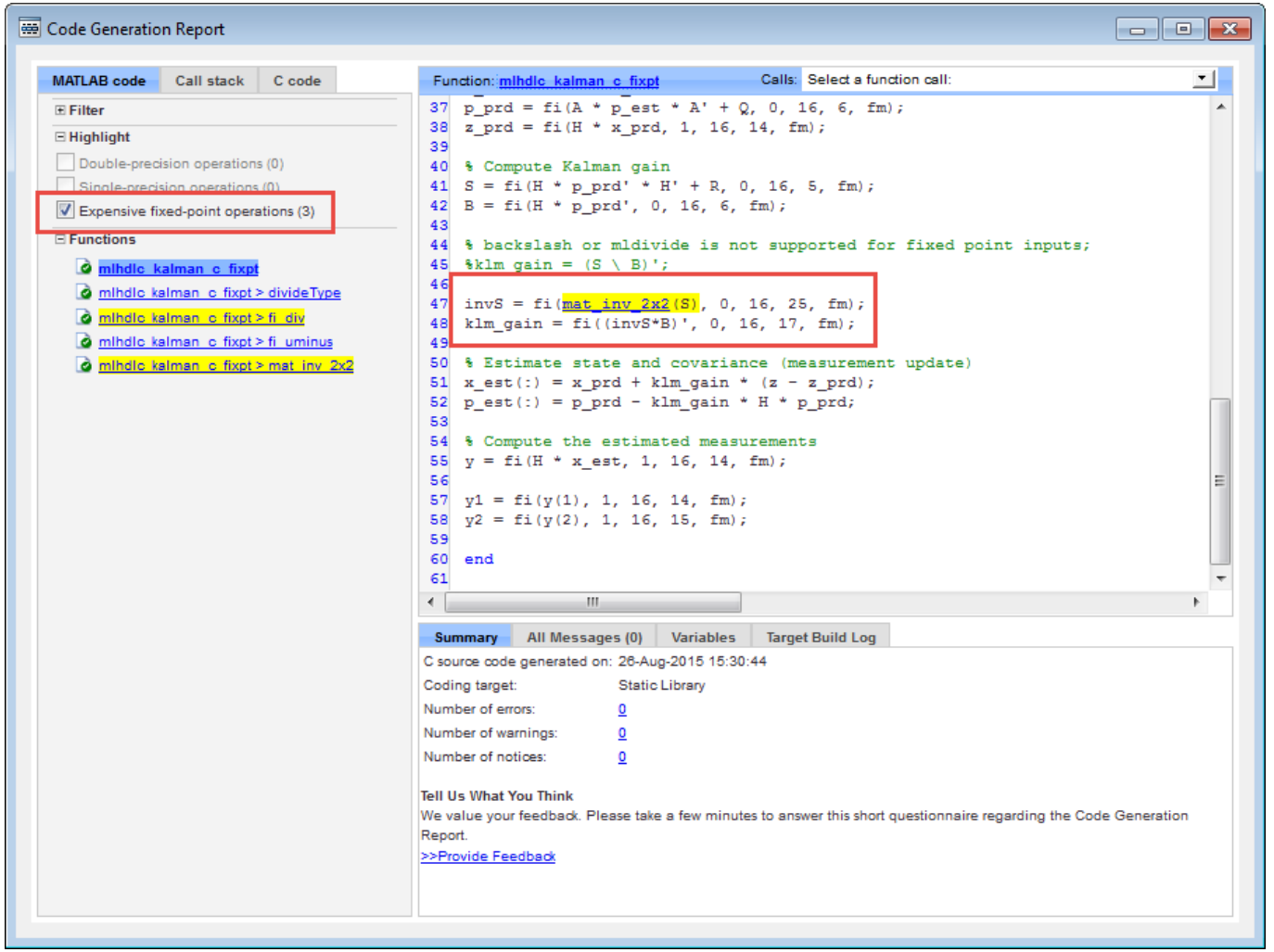
- Available in “Identify questionable fixed-point operations” check
- Detect blocks that generate multiword operations
- Provide highlighted links to trace back to questionable blocks



Detection of multiword operations in MATLAB

Detect multiword operations using Fixed-Point Converter and MATLAB Coder apps

- Available in “Highlight Potential Data Type Issues” check
- Detect MATLAB code that generates multiword operations
- Highlight multiword operations in MATLAB code in the code generation report



System object instrumentation in the Fixed-Point Tool

Collect simulation ranges and propose data types for select System objects used inside a MATLAB function block

You can now convert the following DSP System Toolbox System objects to fixed-point using the Fixed-Point Converter app:

- `dsp.ArrayVectorAdder`
- `dsp.BiquadFilter`
- `dsp.FIRRateConverter`
- `dsp.LowerTriangularSolver`
- `dsp.UpperTriangularSolver`
- `dsp.FIRFilter (DF,TDF structure)`
- `dsp.FIRDecimator`
- `dsp.FIRInterpolator`
- `dsp.VariableFractionalDelay`
- `dsp.Window`
- `dsp.LUFactor`