The No Solution Case

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No Solution Case

A signal equation is a nonzero equation having no variables. It is typically encountered in frame sequences as the equation $0 = 1$.

When a signal equation occurs in a frame sequence, then we report no solution, because a signal equation is a false equation, implying that the system of equations cannot have a solution.

An Example

\[
\begin{align*}
x + 2y + 3z &= 4, \\
- y - 3z &= -1, \\
0 &= 1.
\end{align*}
\]

Signal Equation $0 = 1$. 
An Illustration of the No Solution Case

Frame 1. Original system.

\[
\begin{align*}
    y + 3z &= 2, \\
    x + y &= 3, \\
    x + 2y + 3z &= 4.
\end{align*}
\]

Frame 2.

\[
\begin{align*}
    x + 2y + 3z &= 4, \\
    x + y &= 3, \\
    y + 3z &= 2.
\end{align*}
\]

\text{swap}(1, 3)

Frame 3.

\[
\begin{align*}
    x + 2y + 3z &= 4, \\
    -y - 3z &= -1, \\
    y + 3z &= 2.
\end{align*}
\]

\text{combo}(1, 2, -1)

Frame 4.

\[
\begin{align*}
    x + 2y + 3z &= 4, \\
    -y - 3z &= -1, \\
    0 &= 1.
\end{align*}
\]

\text{combo}(2, 3, 1)

The signal equation \(0 \equiv 1\) is a false equation, therefore the last frame has no solution. Because the toolkit neither creates nor destroys solutions, then the first frame, which is the original system, has \textbf{no solution}. 
Perplexing Frames

Values cannot be assigned to any variables in the case of no solution. This can be perplexing, especially in a final frame like

\[
\begin{align*}
x &= 4, \\
z &= -1, \\
0 &= 1.
\end{align*}
\]

While it is true that \(x\) and \(z\) were assigned values, the final signal equation \(0 = 1\) is false, meaning any answer is impossible.

There is no possibility to write equations for all variables. There is no solution. It is a tragic error to claim \(x = 4, z = -1\) is a solution.