The Essentials of Linear State-Space Systems

Errata

J. Dwight Aplevich
Copyright © J. D. Aplevich, 2006.
An explanation and general *mea culpa*

One is never finished writing a textbook, but it is possible to reach a point where one can stop. I reached such a point with this book, but without fail I can pick it up and find places where things could have been said more simply, clearly, or occasionally, correctly. I have a list of formatting changes, changes that would add to clarity, and typos that are not included here, but if a particular part of the book should be modified, I’d like to hear from you.

In addition to the above minor changes, there are some *errors*, for which corrections can be made available thanks to the web. These changes are also easy to make in subsequent printings of the book.

**Errata, second printing**

- **p. 22**
  The second partial derivative in the second row of partial derivatives should be
  \[
  \frac{\partial f_4}{\partial x_3} \bigg|_o = g/\ell
  \]

- **p. 59**
  In Equation (3.4) the index in the rightmost term should be \( k \), not \( t \).

- **p. 183**
  The line below the first equation should read . . . \( \left[ S_1, S_2 \right] \) gives

**Errata, first printing, corrected in later printings**

- **pp. 30–33, 131, 218**
  The references to Equation (2.4) should be to Equation (2.3).

- **p. 59**
  The dummy variable \( t \) should be \( k \) in (3.4).

- **p. 70**
  In \( S_2 \) the \( D \) matrix should be \( D = [0,0] \) (or note the convention about zero matrices given later on p. 106).

- **p. 72**
  In Problem 8 the matrices should be:
  \[
  A = \begin{bmatrix} 11 & 1 & 0 \\ 7 & 0 & 1 \\ -4 & 0 & 0 \end{bmatrix}, \quad B = \begin{bmatrix} -2 \\ 3 \\ 1 \end{bmatrix}, \quad C = [1, 0, 0], \quad D = 0.
  \]

- **p. 83**
  On the right-hand side of Equation (4.24), \( x \) should have a subscript: \( a_i x_i(t) \).
## Errata

<table>
<thead>
<tr>
<th>Page</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>p. 261</td>
<td>The $(1, 3)$ entry $1/C_1$ in the first row of the coefficient matrix should be $-1/C_1$.</td>
</tr>
<tr>
<td>p. 262</td>
<td>The caption of Figure S4.1(b) should read, “The second linear circuit with tree.”</td>
</tr>
</tbody>
</table>
| p. 275 | The column matrix in the matrix product in the third line of Problem 9 should be \[
\begin{bmatrix}
\cos \phi \\
\sin \phi
\end{bmatrix}
\]. |
The state-space model is used throughout, since it is a fundamental conceptual tool, although the background analysis applies to other models. Modelling and stability of general nonlinear systems is introduced, with the detailed analysis concentrating on LTI systems. J. Dwight Aplevich is the author of The Essentials of Linear State-Space Systems, published by Wiley. No customer reviews. 5 star (0%). In control engineering, a state-space representation is a mathematical model of a physical system as a set of input, output and state variables related by first-order differential equations or difference equations. State variables are variables whose values evolve over time in a way that depends on the values they have at any given time and on the externally imposed values of input variables. Output variables' values depend on the values of the state variables. This new state space system is quite different from the original one, and it is not at all obvious that they represent the same system. (It can be shown that the systems are identical by transforming the state space representation to a transfer function. Techniques for doing so are discussed elsewhere.) Key Concept: Defining a State Space Representation. A nth order linear physical system can be represented using a state space approach as a single first order matrix differential equation: The first equation is called the state equation and it has a first order derivative of the state variable.