

# Design and Implementation of Vibration Data Acquisition in Goodwin Hall for Structural Health Monitoring, Human Motion, and Energy Harvesting Research

Joseph M. Hamilton

Thesis submitted to the Faculty of the  
Virginia Polytechnic Institute and State University  
in partial fulfillment of the requirements for the degree of

Master of Science  
in  
Mechanical Engineering

Pablo A. Tarazaga, Chair  
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Blacksburg, Virginia

Keywords: Building Instrumentation, Structural Health Monitoring, Human Motion,  
Energy Harvesting, Vibration, Accelerometers, Data Acquisition  
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Figures 5.1, 5.2, 5.3, 7.2, 7.3, 7.4.  
 Jessica Thangjitham. Investigating Dynamic Properties of Goodwin Hall and their Sensitivity to Modeling Parameters.  
 M.S. thesis, Virginia Polytechnic Institute and State University, 2015.

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Fair Use Factor	In Favor of Fair Use	In Favor of Copyright Holder (not fair use)
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commercial or educational use for profit or not degree of transformation; value added for criticism, commentary, news reporting, teaching, scholarship, research	★ <i>Research</i>	<i>Commercial activity</i>
	<i>Scholarship</i>	<i>Profit (monetarily) from use</i>
	<i>Nonprofit university</i>	<i>Entertainment</i>
	<i>Criticism</i>	<i>Bad-faith behavior</i>
	<i>Comment</i>	<i>Denying credit to original author</i>
	<i>Transformative: changes the original work for new purpose</i>	
	<i>Parody</i>	
<b>Nature of the Copyrighted Work</b>		
character of the work for example, fact or fiction worthy of (extensive) protection?	★ <i>Published work</i>	<i>Unpublished work</i>
	★ <i>Factual or non-fiction based</i>	<i>Highly creative work (art, music, novels, films, plays)</i>
	<i>Important to favored educational objectives</i>	<i>Fiction</i>
<b>Amount and Substantiality</b>		
use only what's necessary quantity and quality in relation to the whole work	★ <i>Small quantity of the work</i>	<i>Large portion or whole work used</i>
	★ <i>Portion used is not central or significant to entire work</i>	<i>Portion used is central to work or "heart of the work"</i>
	<i>Amount is appropriate for favored educational purpose</i>	
<b>Effect</b>		
harm to potential market or value of a work after a portion has been used separately from the whole	★ <i>User has lawfully acquired copy of the original work</i>	<i>Could replace sale of copyrighted work</i>
	<i>One or fewer copies made</i>	<i>Significantly impairs market or potential market for copyright work or derivative</i>
	★ <i>No significant effect on the market or potential market of copyrighted work</i>	<i>Reasonably available licensing mechanism for use of the copyrighted work</i>
	<i>No similar product marketed by the copyright holder</i>	<i>Affordable permission available for using work</i>
	<i>Lack of licensing mechanism</i>	<i>Numerous copies made</i>
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Name: Joseph Marshall Hamilton

Description of item under review for fair use: Figures 5.1, 5.2, 5.3, 7.2, 7.3, 7.4. Jessica Thangjitham. Investigating Dynamic Properties of Goodwin Hall and their Sensitivity to Modeling Parameters. M.S. thesis, Virginia Polytechnic Institute and State University, 2015.

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#### **Factor 4**

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

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Figure of Goodwin Hall. Goodwin Hall, vt.edu Website.  
<https://www.vt.edu/about/buildings/signatureengineering.html>, 2015.

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#### **Factor 2**

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1032 Connector Assembly Instructions, Diagram No. 1460068,  
Dytran Instruments, Inc., 2011

As a test of fair use in ETDs at Virginia Tech:

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Name: Joseph Marshall Hamilton

Description of item under review for fair use: 10-32 Connector Assembly Instructions, Diagram No. 146-0068, Dytran Instruments, Inc., 2011

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#### **Factor 2**

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

#### **Factor 3**

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#### **Factor 4**

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

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Outline/Installation Drawing 1032 to BNC, Diagram No. 1276011A, Dytran Instruments, Inc., 2002

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<b>Purpose and Character of Use</b> commercial or educational use for profit or not degree of transformation; value added for criticism, commentary, news reporting, teaching, scholarship, research	★ <i>Research</i>	<i>Commercial activity</i>
	<i>Scholarship</i>	<i>Profit (monetarily) from use</i>
	<i>Nonprofit university</i>	<i>Entertainment</i>
	<i>Criticism</i>	<i>Bad-faith behavior</i>
	<i>Comment</i>	<i>Denying credit to original author</i>
	<i>Transformative: changes the original work for new purpose</i>	
	<i>Parody</i>	
<b>Nature of the Copyrighted Work</b> character of the work for example, fact or fiction worthy of (extensive) protection?	★ <i>Published work</i>	<i>Unpublished work</i>
	<i>Factual or non-fiction based</i>	<i>Highly creative work (art, music, novels, films, plays)</i>
	<i>Important to favored educational objectives</i>	<i>Fiction</i>
<b>Amount and Substantiality</b> use only what's necessary quantity and quality in relation to the whole work	<i>Small quantity of the work</i>	★ <i>Large portion or whole work used</i>
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Description of item under review for fair use: Outline/Installation Drawing 10-32 to BNC, Diagram No. 127-6011A, Dytran Instruments, Inc., 2002

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#### **Factor 2**

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

#### **Factor 3**

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#### **Factor 4**

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Assembly Instructions BNC Connector, Diagram No. 1460038,  
Dytran Instruments, Inc., 2004

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<b>Purpose and Character of Use</b> commercial or educational use for profit or not degree of transformation; value added for criticism, commentary, news reporting, teaching, scholarship, research	★ <i>Research</i>	<i>Commercial activity</i>
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	<i>Nonprofit university</i>	<i>Entertainment</i>
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	<i>Comment</i>	<i>Denying credit to original author</i>
	<i>Transformative: changes the original work for new purpose</i>	
	<i>Parody</i>	
<b>Nature of the Copyrighted Work</b> character of the work for example, fact or fiction worthy of (extensive) protection?	★ <i>Published work</i>	<i>Unpublished work</i>
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Coax Cable Diagram No. 1450129, Dytran Instruments, Inc., 2004

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