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Natural Rhythms and Temporal Perception - Visualization of Sunlight Patterns
with Energy Monitoring

Christoph Opitz

Thesis

Fig. 1.1 Akademie Mont-Cenis in Herne, GER [used with permission] 3
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 accessed: Jan. 22, 2018
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22.1.2018 File:Akademie Mont-Cenis view inside 1.jpg - Wikimedia Commons


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File:Akademie Mont-Cenis view inside 1.jpg

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Description	English: Akademie Mont-Cenis in Herne, Germany, a glass covered building on wooden pillars with buildings for education, living, meeting halls, and a library inside. More than a half of the glass panes on top and south and west side have solar cells for producing electric energy.
Date	12 June 2006
Source	Own work
Author	Arnold Paul
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Date	17 October 2010, 14:49:14
Source	Own work
Author	Frank Vincentz
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Fig. 1.2 Energy Base in Vienna, AUT [used with permission]

4

Architect: POS architekten

(Source: <http://www.pos-architecture.com>)

POS Architecture (top)

a) http://www.pos-architecture.com/wp-content/uploads/2017/03/energybase-winter_sommer-768x382.jpg

© POS architekten ZT gmbh

Hertha Hurnaus (bottom)

b) <http://www.pos-architecture.com/wp-content/uploads/2017/03/energybase-6-768x768.jpg>

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From: public - pos architekten

Sent: Monday, January 22, 2018 4:39 AM

To: 'opitchr@vt.edu'

Subject: AW: Anfrage zu Bildrechten

Sehr geehrter Herr Opitz,
den Schnitt könne Sie unter angebe des © POS architekten ZT gmbh gerne verwenden. Bei den Fotos bitte noch die Fotografin Herta Hurnaus anführen.
Herzliche Grüße und gutes Gelingen für Ihre Präsentation

Bernadette Ruis

Mag. Bernadette Ruis MAS

POS architekten ZT gmbh
Maria Treu Gasse 3 / 15
A-1080 Wien

+43 1 409 5265-81

public@pos-architecture.com

pos-architecture.com

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architecture.

Von: Christoph Opitz [<mailto:opitchr@vt.edu>]
Gesendet: Dienstag, 16. Jänner 2018 22:28
An: office - pos architekten
Betreff: FW: Anfrage zu Bildrechten

Sehr geehrte Damen und Herren,

Vor etwa 2 Jahren war ich in Ihrem Büro um Frau Arch. DI Ursula Schneider zum Projekt Energy Base zu interviewen. Sie hat mir damals nach der Besprechung eine Präsentation Ihres Büros (Schneider_B2_1.pdf) zur Information gesendet. Ich bin gerade dabei mich für die Verteidigung meiner Masterarbeit vorzubereiten und möchte um Ihre Erlaubnis bitten ein Bild aus diesem Endbericht in meinem Dokument mit entsprechender Zitierung verwenden zu dürfen. Ich würde den Titel der Präsentation und die POS architekten ZT gmbh als Quelle angeben.

Drei weitere Bilder würde ich aus einem Bericht der Wirtschaftsagentur Wien (ENERGYbase – Ein Raum für Innovationen) entnehmen und ich möchte Sie ebenfalls zwecks Bildrechten fragen ob diese Bilder von Ihrem Büro angefertigt wurden.

Im Anhang finden Sie die betreffende Seite aus der Rohversion meiner Arbeit. Die Bilder sind hier noch in geringer Auflösung eingefügt.

Vielen Dank und beste Grüße aus Blacksburg, Virginia!

Christoph Opitz

MSc graduate Student
College of Architecture and Urban Studies
Virginia Tech

Sent from [Mail](#) for Windows 10

From: Hertha Hurnaus
Sent: Sunday, January 28, 2018 12:23 PM
To: Christoph Opitz
Subject: Re: Anfrage zu Bildrechten

Sehr geehrter Herr Opitz,
Sie können gerne die gewünschten Fotos für Ihre Diplomarbeit honorarfrei verwenden, als Fotocredit bitte einfach meinen Namen angeben.

Alles Gute für die Diplomarbeit und schöne Grüße
Hertha Hurnaus

Hertha Hurnaus
Koestlergasse 3/9
A - 1060 Vienna
Tel/Fax: 0043/1/5235064
Mobile: 0043/699/10441733
<http://www.hurnaus.com>

Am 26.01.2018 um 22:15 schrieb Christoph Opitz <opitchr@vt.edu>:

Sehr geehrte Frau Hurnaus,

Vor etwa 2 Jahren war ich im Büro POS Architekten um Frau Arch. DI Ursula Schneider zum Projekt Energy Base zu interviewen. Sie hat mir damals nach der Besprechung eine Präsentation ihres Büros (Schneider_B2_1.pdf) zur Information gesendet. Im Email unten wurde ich informiert, dass die Fotos vom Projekt Energy Base von Ihnen genacht wurden. Ich bin gerade dabei mich für die Verteidigung meiner Masterarbeit vorzubereiten und möchte um Ihre Erlaubnis bitten ein Bild das die gefaltete Fassade von innen zeigt in meinem Dokument mit entsprechender Zitierung verwenden zu dürfen.

Im Anhang sende ich Ihnen die betreffende Seite aus meinem Diplomarbeitsskript zur Illustration (siehe Fig. 1.2 auf Seite 4).

Vielen Dank und beste Grüße aus Blacksburg, Virginia!

Christoph Opitz

MSc graduate Student
College of Architecture and Urban Studies
Virginia Tech

Fig. 1.3 Plus-Energy Office High-rise Building in Vienna, AUT [used with permission] 4

Architect: Kratochwil-Waldbauer-Zeinitzer

Building Physics: Schöberl & Pöll GmbH

(Source: <http://www.schoeberlpoell.at>)

a) <http://www.schoeberlpoell.at/de/ueber-uns/presse/download-tu-plus-energie-getreidemarkt?file=files/download/Download%20TU%20Plus%20Energie%20Getreidemarkt/TU%20Plusenergie%20Dachterrasse%20mit%20PV.jpg> (accessed Jan. 22, 2018) © Schöberl & Pöll GmbH

b) Österreichs größtes Plus-Energie-Bürogebäude am Standort Getreidemarkt der TU Wien, Final project report, Vienna, June 2014, fig.83, p 110 © Schöberl & Pöll GmbH

c) <http://www.schoeberlpoell.at/de/ueber-uns/presse/download-tu-plus-energie-getreidemarkt?file=files/download/Download%20TU%20Plus%20Energie%20Getreidemarkt/TU%20Plusenergie%20Bueros.jpg> (accessed Jan. 22, 2018) © Schöberl & Pöll GmbH
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From: Helmut Schöberl

Sent: Wednesday, January 17, 2018 4:32 AM

To: 'Christoph Opitz'

Subject: AW: Anfrage zu Bildrechten

sehr geehrter herr opitz

gerne können sie aktuelle fotos von <http://www.schoeberlpoell.at/de/ueber-uns/presse/download-tu-plus-energie-getreidemarkt> verwenden

können sie mir bitte die rohversion ihrer masterarbeit mailen

Mit freundlichen Grüßen

Helmut Schöberl

Schöberl & Pöll GmbH

Bauphysik und Forschung

Helmut Schöberl (Dipl.-Ing.)

1020 Wien, Lassallestraße 2/6-8

Firmenbuchgericht Wien: 332553z

helmut.schoeberl@schoeberlpoell.at

tel: 0043/1/726 45 66/11, fax: /18

www.schoeberlpoell.at

Von: Christoph Opitz [mailto:opitchr@vt.edu]

Gesendet: Dienstag, 16. Jänner 2018 22:09

An: Helmut Schoeberl <helmut.schoeberl@schoeberlpoell.at>

Betreff: Anfrage zu Bildrechten

Sehr geehrter Herr Schöberl,

Vor etwa 2 Jahren war ich in Ihrem Büro um Sie zum Plus-Energie Bürohochhaus am Getreidemarkt zu interviewen. Sie haben mir damals den Endbericht ihres Büros zur Information gegeben. Ich bin gerade dabei mich für die Verteidigung meiner Masterarbeit vorzubereiten und möchte um Ihre Erlaubnis bitten zwei Bilder aus diesem Endbericht in meinem Dokument mit entsprechender Zitierung verwenden zu dürfen. Ich würde den Titel des Endberichts und die Schöberl & Pöll GmbH als Quelle angeben.

Im Anhang finden Sie die betreffende Seite aus der Rohversion meiner Arbeit. Die Bilder sind hier noch in geringer Auflösung eingefügt.

Besten Dank und viele Grüße aus Blacksburg, Virginia!

Christoph Opitz

MSc graduate Student
College of Architecture and Urban Studies
Virginia Tech

Sent from [Mail](#) for Windows 10

Fig. 1.4 Moss Arts Center facilities: performance hall, visual arts galleries,
ICAT facilities [used with permission]
Design Architect: Snøhetta
Executive Architect: STV Group Inc.
(Source: Moss Arts Center - construction documents)
used with permission from Virginia Polytechnic Institute and State University; email attached

5

From: Gess, Mark
Sent: Friday, February 23, 2018 1:29 PM
To: Opitz, Christoph
Subject: RE: Request for permission to use information from the Moss ArtsCenter construction documentation in Master's thesis

Christoph:

I followed-up on your request and there are no issues with you using the documents you need for your thesis.

Mark

From: Christoph Opitz [mailto:opitchr@vt.edu]
Sent: Wednesday, February 21, 2018 10:45 AM
To: Gess, Mark <mgess@vt.edu>
Subject: Request for permission to use information from the Moss Arts Center construction documentation in Master's thesis

Dear Mr Gess,

As requested I prepared a document showing the pages of my master's thesis in which I used plans and lighting specification for the documentation of my project in the Sandbox in the Moss Arts Center. Please refer to the attached PDF document. I highlighted the captions of the figures concerned for your reference. I also included the pages with the citations of copyrighted work.

The request for permission is pertaining to requirements for the submission of my Electronic Thesis Document (ETD) to the Virginia Tech graduate school.

Many thanks and best regards!

Sincerely,
Christoph Opitz

MSc graduate student
College of Architecture and Urban Design

Sent from [Mail](#) for Windows 10

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- Fig. 1.6 ICAT Maker Camp 2014 - designing and building instruments in the Sandbox 6
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used with permission from Moss Arts Center; email attached
- Fig. 3.1 ICAT workspace Sandbox [used with permission] 27
(Source: <https://artscenter.vt.edu>)
https://artscenter.vt.edu/content/dam/artscenter_vt_edu/landingpages/facilities-gallery/facilities11.jpg.transform/xl-medium/image.jpg (accessed Nov. 13, 2017)
used with permission from Moss Arts Center; email attached
-

From: Bland, Susan
Sent: Tuesday, February 20, 2018 4:40 PM
To: Opitz, Christoph
Subject: RE: ICAT photo permissions

Ahhh...for your thesis! Of course, Christoph, you have our permission to use the photos. I was just reading over summaries of funded SEAD grants last week and remember reading about this project. Good luck and let me know if you need anything else!

Thanks,
Susan

From: Christoph Opitz [<mailto:opitchr@vt.edu>]
Sent: Tuesday, February 20, 2018 4:34 PM
To: Bland, Susan <subland@vt.edu>
Subject: RE: ICAT photo permissions

Dear Susan,

I would like to use the two images, one directly from artscenter.vt.edu, and one from the Moss Arts Center's flickr page in my master's thesis. In the introduction I am describing the idea of my thesis project for a proposed skylight with integrated dynamic LED lighting to improve the light condition of the space. I briefly describe the current design and use of the Sandbox in chapter 1 (introduction). In chapter 3 (Sandbox documentation) I documented the Sandbox in detail. Please refer to the attached PDF document with the mentioned images on pages 6 and 27 for your information. I would cite the images as follows if I receive permission to use them in my thesis:

Fig. 1.5 View down into Sandbox through second-story windows [used with permission]
https://artscenter.vt.edu/content/dam/artscenter_vt_edu/landingpages/facilities-gallery/facilities11.jpg.transform/xl-medium/image.jpg (accessed Nov. 13, 2017)
used with permission from Moss Arts Center; letter attached

Fig. 1.6 ICAT Maker Camp 2014 - designing and building instruments in the Sandbox [used with permission]
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used with permission from Moss Arts Center; letter attached

Fig. 3.1 ICAT workspace Sandbox [used with permission]
https://artscenter.vt.edu/content/dam/artscenter_vt_edu/landingpages/facilities-gallery/facilities11.jpg.transform/xl-medium/image.jpg (accessed Nov. 13, 2017)
used with permission from Moss Arts Center; letter attached

For the submission of the ETD I need to cite copyrighted work such as images and provide evidence that they are either in the public domain or that I have permission to use them.

(Source: *Handbook of Photovoltaic Science and Engineering*, Jeffery L. Gray, 2011, p. 83) © 2011 John Wiley & Sons

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Format	Print and electronic
Portion	Figure/table
Number of figures/tables	1
Original Wiley figure/table number(s)	Figure 3.1 (page 62)
Will you be translating?	No
Title of your thesis / dissertation	Natural Rhythms and Temporal Perception - Visualization of Sunlight Patterns with Energy Monitoring
Expected completion date	Feb 2018
Expected size (number of pages)	120
Requestor Location	Mr. Christoph Opitz 1203A Gladewood Drive BLACKSBURG, VA 24060 United States Attn: Mr. Christoph Opitz
Publisher Tax ID	EU826007151
Total	0.00 USD

Fig. 2.2	Photovoltaic effect in a solar cell [used with permission] (Source: <i>The Physics of Solar Cells</i> , Jenny Nelson, 2003, p. 1) © 2003 Imperial College Press used with permission from World Scientific Publishing Co.; email attached	15
Fig. 2.3	Photoelectric effect [used with permission] (Source: <i>The Physics of Solar Cells</i> , Jenny Nelson, 2003, p. 1) © 2003 Imperial College Press used with permission from World Scientific Publishing Co.; email attached	15
Fig. 2.6	Power optimizing with MPPT [used with permission] (Source: <i>The Physics of Solar Cells</i> , 2003, p. 12) © 2003 Imperial College Press used with permission from World Scientific Publishing Co.; email attached	16
Fig. 2.7	Strings of modules form a PV array [used with permission] (Source: <i>The Physics of Solar Cells</i> , 2003, p. 5) © 2003 Imperial College Press used with permission from World Scientific Publishing Co.; email attached	16

From: Rights
Sent: Friday, January 26, 2018 3:26 AM
To: Christoph Opitz
Subject: RE: Request of permission to use diagrams in MSc thesis

Dear Christoph Opitz

Thanks for getting in touch.

We will be pleased to grant you the permission of reproducing Fig 2.1-2.3 and Fig 2.6 and Fig 2.7 from our title 'The Physics of Solar Cells' in your master's thesis, provided that full credit been given to the original source in the following format:

Title of the Work, Author (s) and/or Editor(s) Name (s),
Copyright @ year and name of the publisher

Kind regards,
Tu Ning

From: Christoph Opitz [mailto:opitchr@vt.edu]
Sent: Tuesday, 23 January, 2018 7:11 AM
To: Rights <rights@wspc.com>
Subject: Request of permission to use diagrams in MSc thesis

Dear Sir or Madam,

My name is Christoph Opitz and I am currently preparing to defend my master's thesis in the Building

Science program here at the Virginia Tech College of Architecture and Design. I have contacted one of the authors of your publication "The physics of solar cells" from 2003 to ask for permission to use and cite a few diagrams in my thesis document. Prof Jenny Nelson granted the permission from her side (see attached email), but also suggested to contact the publisher.

I would like to ask your permission to use four diagrams from mentioned book in my thesis document. Refer to the attached preliminary layout and text for your information. The figures 2.1, 2.2, 2.3 on page 3 and 2.6, 2.7 on page 4 show the diagrams taken from "The physics of solar cells".

Thank you very much and best regards from Blacksburg!

Sincerely,

Christoph Opitz
MSc graduate student
College of Architecture and Urban Studies
Virginia Tech

Sent from [Mail](#) for Windows 10

[public domain]

(Source: Study Guide for Photovoltaic System Installers and Sample Examination Questions, 2005, p. 8)

<https://energy.gov/sites/prod/files/2014/11/f19/g-fsec-gp-274-03.pdf>

From: Jim Dunlop

Sent: Monday, January 22, 2018 12:10 PM

To: Christoph Opitz

Subject: Re: Request for permission to use diagrams in MSc thesis

Christoph,

Sure no problems in using this figure for your thesis, nothing proprietary about PV module IV curves. This information is in the public domain and included on most every PV module specification sheet.

Good luck with your program.

Jim

James Dunlop, PE

(321).704-1097

Jim@JimDunlopSolar.com

www.JimDunlopSolar.com

On Mon, Jan 22, 2018 at 11:32 AM, Christoph Opitz <opitchr@vt.edu> wrote:

Dear Mr Dunlop,

My name is Christoph Opitz and I am currently preparing to defend my master's thesis in the Building Science program here at the Virginia Tech College of Architecture and Design. I have done research on the Visualization of Sunlight Patterns with Energy Monitoring which included a case study for the design of PV integrated skylights with dynamic LED skylight well lighting.

In my literature review chapter I am describing the photovoltaic and photoelectric effect to the reader to establish a theoretical framework for my project. I am citing the book "Study Guide for Photovoltaic System Installers and Sample Examination Questions" in my thesis document and would like to use one diagram properly cited for illustration.

I would like to ask your permission to use one diagram from mentioned book in my thesis document as shown in the attached preliminary layout and text – see page 4.

Thank you very much and best regards from Blacksburg!

Sincerely,

Christoph Opitz

MSc graduate student

College of Architecture and Urban Studies

Virginia Tech

Sent from [Mail](#) for Windows 10

Fig. 2.8 Kruithof curve - pleasant lighting conditions based on illuminance and color temperature (1941) [fair use]

19

(Source: Kruithof, A. A. 1941. "Tubular Luminescence Lamps for General Illumination," Philips Technical Review Vol. VI, No. 3, pp. 65-73.)

(accessed Jan. 21, 2018 from *All Things Lighting*)

<http://agi32.com/blog/2015/01/12/the-kruithof-curve/>

The image is used for non-commercial research purposes to inform the reader about the findings presented in a paper which was published in 1941. I obtained the image from lighting researcher Ian Ashdown who informed me about the correct image citation in the original journal which is very rare and difficult to access.

From: Ian Ashdown
Sent: Sunday, February 18, 2018 9:49 PM
To: 'Christoph Opitz'
Subject: RE: Image Citation

Hi, Christoph. I scanned the image from one of the few remaining copies of the original journal. The proper image credit is therefore:

Kruithof, A. A. 1941. "Tubular Luminescence Lamps for General Illumination," Philips Technical Review Vol. VI, No. 3, pp. 65-73.

I am not a lawyer, but I believe use of the image is permitted for non-commercial purposes under the [Fair Use](#) doctrine.

Ian Ashdown, P. Eng. (Ret.), FIES
Senior Scientist
SunTracker Technologies Ltd.
www.suntrackertech.com

From: Christoph Opitz [mailto:opitchr@vt.edu]
Sent: February 17, 2018 4:33 PM
To: allthingslighting@gmail.com
Subject: Image Citation

Dear Mr Ashdown,

My name is Christoph Opitz and I have just defended my master's thesis in the Building Science program here at the Virginia Tech College of Architecture and Design. I have done research on the Visualization of Sunlight Patterns with Energy Monitoring which included a case study for the design of PV integrated skylights with dynamic LED skylight well lighting.

In my literature review chapter I am citing your article on the Kruithof curve published on All Things Lighting. I also would like to use Kruithof's original drawing of the curve (Fig. 3 in your article). Is this image in the public domain at this point or do I need permission to use it in my thesis?

Please refer to the attached draft layout and text for your information.

Thank you very much and best regards from Blacksburg!
Sincerely,

Christoph Opitz
MSc graduate student
College of Architecture and Urban Studies
Virginia Tech

Sent from [Mail](#) for Windows 10

(Source: De Kort & Smolders, 2010, p. 346)

used with permission from Yvonne A. W. de Kort; email attached

From: Kort, Y.A.W. de

Sent: Tuesday, January 16, 2018 4:35 PM

To: Christoph Opitz

Subject: Re: Citation - Image permission request for reference in Master'sthesis

Dear Christoph,

Thanks for asking, and yes this is fine by me.

Best of luck on your thesis & defense,
Yvonne

Prof.dr.ir. Yvonne A. W. de Kort
environmental psychology; psychology of light

Chair contextual aspects of Human-Technology Interaction
Human-Technology Interaction group
Department of Industrial Engineering & Innovation Sciences

Program manager Sound Lighting
Intelligent Lighting Institute

Technische Universiteit Eindhoven
IPO 1.23
y.a.w.d.kort@tue.nl
040.247.2889

On Jan 16, 2018, at 9:25 PM, Christoph Opitz <opitchr@vt.edu> wrote:

Dear Dr de Kort,

My name is Christoph Opitz and I am currently preparing to defend my master's thesis in the Building Science program here at the Virginia Tech College of Architecture and Design. I have done research on the Visualization of Sunlight Patterns with Energy Monitoring which included a case study for the design of PV integrated skylights with dynamic LED skylight well lighting.

I have mentioned your research on dynamic lighting citing your 2010 paper "Effects of dynamic lighting on office workers: First results of a field study with monthly alternating settings" to demonstrate the potential benefit of dynamic lighting.

I would like to ask your permission to use one of the diagrams from mentioned paper in my thesis document to illustrate the features of the dynamic lighting you have used for your studies. Refer to the attached preliminary layout and text for your information.

Thank you very much and best regards from Blacksburg!
Sincerely,

Fig. 2.10 Sculptural PV array at the Universal Forum of Cultures in Barcelona
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 (Source: <https://commons.wikimedia.org>)
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Summary

Description	English: Photovoltaic Pergola in the "Forum de las Culturas" (Barcelona, Spain) With an area of almost 4000 m2 and 2,682 l-165 modules, it is a magnificent example of the architectural integration of solar panels. This is an Isofoton project.
Date	
Source	Own work
Author	Isofoton.es

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You are free:

Fig. 3.9	Location of the Sandbox in the Moss Arts Center [used with permission] Design Architect: Snøhetta Executive Architect: STV group Inc. (Source: Moss Arts Center - construction documents) used with permission from Virginia Polytechnic Institute and State University; email attached	37
Fig. 3.19	STRP31 linear ceiling lamp [used with permission] Design Architect: Snøhetta Executive Architect: STV group Inc. (Source: Moss Arts Center - construction documents) used with permission from Virginia Polytechnic Institute and State University; email attached	42
Fig. 3.20	Luminaire specifications [used with permission] Design Architect: Snøhetta Executive Architect: STV group Inc. (Source: Moss Arts Center - construction documents) used with permission from Virginia Polytechnic Institute and State University; email attached	42
Fig. 3.21	Philips F28T5 datasheet [used with permission] Design Architect: Snøhetta Executive Architect: STV group Inc. (Source: Moss Arts Center - construction documents) used with permission from Virginia Polytechnic Institute and State University; email attached	42
Fig. 3.29	Room 160 “Digital Imaging” as shown in the Moss Arts Center construction documentation, Level 01 – Partial Life Safety Plan [used with permission] Design Architect: Snøhetta Executive Architect: STV group Inc. (Source: Moss Arts Center - construction documents) used with permission from Virginia Polytechnic Institute and State University; email attached	45

From: Gess, Mark
Sent: Friday, February 23, 2018 1:29 PM
To: Opitz, Christoph
Subject: RE: Request for permission to use information from the Moss ArtsCenter construction documentation in Master's thesis

Christoph:

I followed-up on your request and there are no issues with you using the documents you need for your thesis.

Mark

From: Christoph Opitz [mailto:opitchr@vt.edu]
Sent: Wednesday, February 21, 2018 10:45 AM
To: Gess, Mark <mgess@vt.edu>
Subject: Request for permission to use information from the Moss Arts Center construction documentation in Master's thesis

Dear Mr Gess,

As requested I prepared a document showing the pages of my master's thesis in which I used plans and lighting specification for the documentation of my project in the Sandbox in the Moss Arts Center. Please refer to the attached PDF document. I highlighted the captions of the figures concerned for your reference. I also included the pages with the citations of copyrighted work.

The request for permission is pertaining to requirements for the submission of my Electronic Thesis Document (ETD) to the Virginia Tech graduate school.

Many thanks and best regards!

Sincerely,
Christoph Opitz

MSc graduate student
College of Architecture and Urban Design

Sent from [Mail](#) for Windows 10

Fig. 3.17 Color Temp Meter app [fair use]

40

(Source: Google Play store)

<https://play.google.com/store/apps/details?id=cassiopeia.camera>
screenshot from website

The image is used for non-commercial research documentation purposes via taking a screenshot during the process of purchasing the mentioned app for my Android smartphone.

Fig. 4.1 Multiple exposure of midnight sun [used with permission]
(Source: <https://worldfoto.photoshelter.com>)
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Invoice #1110448955

Order Date: Feb 23, 2018 03:54PM
Order Status: Complete
Order Total: \$15.00

ORDER SUMMARY

Subtotal	\$15.00
Shipping	\$0.00
*Sales Tax	\$0.00
Total	\$15.00
Credit Card Payment 2018-02-23 (Received)	-\$15.00
MasterCard xxxxxxxxxxxx44854 Transaction #ch_1ByoUJ2mFpbdsbZ8Spd0qZIT	

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Fig. 4.5	VT CAUS Research and Demonstration Facility [used with permission] (Source: https://www.caus.vt.edu/about/research) https://www.caus.vt.edu/wp-content/uploads/2016/03/RDFcrop.png (accessed Jan. 24, 2018) used with permission from College of Architecture and Urban Studies	54
Fig. 4.6	Roof of test cell building at RDF [used with permission] (Source: https://www.caus.vt.edu/about/research) https://vtnews.vt.edu/content/dam/vtnews_vt_edu/articles/2014/06/images/061114-research-rooftop.jpg (accessed Jan. 24, 2018) used with permission from College of Architecture and Urban Studies	54

The image is used with permission from Marya Barlow, Communications Director at the College of Architecture and Urban Studies.
540-231-2108
mbarlow@vt.edu

Fig. 4.27	LED circuit design [fair use] (Source: ledcalculator.net) PDF created from website	62
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The content of the figure was created as a PDF using the free online service ledcalculator.net. I used the content for non-commercial research purposes.

Fig. 4.54	Test cell building at RDF [fair use] (Map source: maps.google.com)	71
Fig. 4.62	Top view of test cell building [fair use] (Map source: maps.google.com)	74
Fig. 4.63	Model orientation [fair use] (Map source: maps.google.com)	74
Fig. 4.78	Location of sunlight recorder at RDF in relation to the light sensor (pyranometer) at Virginia-Maryland College of Veterinary Medicine (Vet Med) [fair use] (Map source: maps.google.com)	81

The Google maps terms of service permit to "publicly display Content with proper attribution online, in video, and in print;" (https://www.google.com/intl/en_us/help/terms_maps.html).

- Fig. 4.85 Colorized datafile translating color temperature to RGB values created by Mitchell Charity [fair use] 85
(Source: <http://www.vendian.org/mncharity/dir3/blackbody/>)
screenshot from website
- Fig. 4.86 Limitations of displaying color temperature on a computer screen [fair use] 86
(Source: <http://www.vendian.org/mncharity/dir3/blackbody/intensity.html>)
screenshot from website
-

The images are used for non-commercial research documentation purposes via taking two screenshots from Mitchell Charity's publicly accessible educational website. I created new content with the contents of the datafile by using the RGB values for my lighting control protocol gradients.

Fig. 4.96 LED dimming with pulse width modulation [used with permission]
 (Source: <https://commons.wikimedia.org>)
 author: The arduino.cc team
https://upload.wikimedia.org/wikipedia/commons/4/49/Pwm_5steps.gif
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28.1.2018

File:Pwm 5steps.gif - Wikimedia Commons



File:Pwm 5steps.gif



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 Pulse Width Modulation



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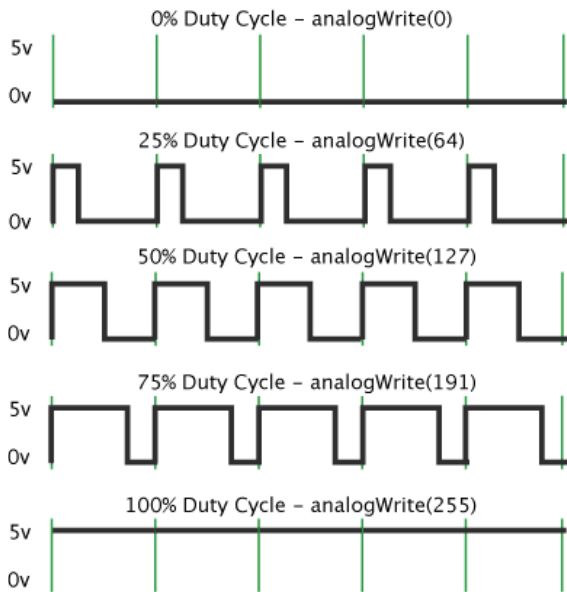
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Pwm_5steps.gif (400 × 438 pixels, file size: 12 KB, MIME type: image/gif)

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Summary

Description	English: A diagram showing a pulse width modulated signal at 0%, 25%, 50%, 75% and 100% intensity.
Date	26 September 2010
Source	http://arduino.cc/it/Tutorial/PWM
Author	The arduino.cc team

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Fig. 4.97 Raspberry Pi 3 single board computer [public domain]
 (Source: <https://commons.wikimedia.org>)
<https://upload.wikimedia.org/wikipedia/commons/d/d4/Raspberry-Pi-2-Bare-BR.jpg>

24.1.2018


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Original file (3,400 × 2,700 pixels, file size: 2.72 MB, MIME type: image/jpeg); ZoomViewer: [flash/no flash](#)

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Description	The Raspberry Pi 2 (model B), showing an HDMI port, audio/video port, Micro USB power input and two ribbon connectors. The Raspberry Pi 2 is an inexpensive (\$35) and self-contained micro-computer that features a 900 MHz, 32-bit quad-core ARM processor and 1 GB of RAM. Built by the Raspberry Pi Foundation, it is designed to be an easy and accessible platform to promote computer science. The Pi has also become a popular computer for hobbyists, who use it for personal projects, video game emulators and digital media playback.
Date	3 July 2016
Source	Own work
Author	Evan-Amos
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Photo by Evan-Amos


About English: This photo was taken by Evan-Amos as a part of Vanamo Media, which creates public domain works for educational purposes. Please visit my other galleries and projects for other free media.

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Image Galleries	Candy	Food	People	Everyday	Video Games	My Flickr (https://www.flickr.com/photos/30348074@N00)



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	Date/Time	Thumbnail	Dimensions	User	Comment
	07:00, 4 July 2016		3,400 × 2,700 (2.72 MB)	Evan-Amos (talk contribs)	{{Information Description=The bottom of a Raspberry Pi 2 (model B), showing a Micro-SD expansion slot. The Raspberry Pi 2 is an inexpensive (\$35) and self-contained micro-computer that features a 900 MHz, 32-bit quad-core ARM processor and 1 GB of RA...

• You cannot overwrite this file.

Fig. 4.98 Raspberry Pi 3 GPIO pin layout [public domain]
(Source: openclipart.org)

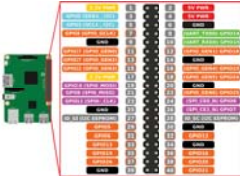
https://openclipart.org/image/2400px/svg_to_png/280972/gpiopinsv3withpi.png

28.1.2018

Clipart - Raspberry Pi 3 GPIO Pin Chart with Pi

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By [dirkk](#) ▶ ×

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The Google maps terms of service permit to "publicly display Content with proper attribution online, in video, and in print;" (https://www.google.com/intl/en_us/help/terms_maps.html).

Fig. 5.20 Detected and actual luminance: Eyes vs Camera [used with permission] 139
(Source: www.cambridgeincolour.com)
https://cdn.cambridgeincolour.com/images/tutorials/gamma_chart1e.png
(accessed Dec. 15, 2017)
used with permission from Sean McHugh; email attached

Fig. 5.21 Gradient encoding - linear vs gamma The representation of dark tones is improved. [used with permission] 139
(Source: www.cambridgeincolour.com)
a) https://cdn.cambridgeincolour.com/images/tutorials/gamma_gradient3b.jpg
b) https://cdn.cambridgeincolour.com/images/tutorials/gamma_gradient2b.png
c) https://cdn.cambridgeincolour.com/images/tutorials/gamma_gradient1b.png
(accessed Feb. 1, 2018)
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Fig. 5.22 Gamma correction - sequence of operational steps [used with permission] 140
(Source: www.cambridgeincolour.com)
a) https://cdn.cambridgeincolour.com/images/tutorials/gamma_chart5c.png
b) https://cdn.cambridgeincolour.com/images/tutorials/gamma_chart3c.png
c) https://cdn.cambridgeincolour.com/images/tutorials/gamma_chart4d.png
d) https://cdn.cambridgeincolour.com/images/tutorials/gamma_display22.png
(accessed Dec. 15, 2017)
used with permission from Sean McHugh; email attached

From: Sean McHugh
Sent: Tuesday, January 16, 2018 6:15 PM
To: Christoph Opitz
Subject: Re: Image permission request for the use as reference in Master'sthesis

Hi Christoph,

Thank you for the email request. I don't see a problem with you using a paragraph and a few diagrams

as described, presuming that my name / website and a credited link are provided. Please let me know if you need additional clarification.

Best,
Sean

On Tue, Jan 16, 2018 at 12:52 PM, Christoph Opitz <opitchr@vt.edu> wrote:

Dear Mr McHugh,

I am currently preparing for the defense of my master's thesis in the field of Building Science at Virginia Tech's College of Architecture and Urban Studies. I have done research on the Visualization of Sunlight Patterns with Energy Monitoring and have analyzed digital photos of my study model taken with a GoPro Hero 4 action camera. I explained the concept of gamma correction in my thesis and quoted a paragraph from your website <https://www.cambridgeincolour.com/tutorials/gamma-correction.htm>.

I would like to ask for your permission to use a few of the diagrams from this web page for illustration as shown in the attached draft of my thesis document.

Thank you and best regards from Blacksburg!

Sincerely,

Christoph Opitz

MSc graduate student

College of Architecture and Urban Studies

Virginia Tech