様式Ｓ－１－７

基盤Ａ・Ｂ・Ｃ（一般）－１

平成17年度 基盤研究(A･B･C)（一般）研究計画調書(新規)

注１．別途平成17年度基盤研究(A･B･C)（一般）研究計画調書作成･記入要領(黄色)を参照してください。
注２．※印の欄は研究機関において記入してください。

※機関番号	
※整理番号	

基盤研究	A・B・(C)	審査区分	一般

審査希望部門	分野	分科	細目	細目番号(4ケタ)
	総合領域	情報学	メディア情報学・データベース	1004

審査希望部門	分割番号		
	総合・新領域系	(A)・B	← 分割番号が付されている細目を選択した場合，どちらかに必ず○を付すること（「作成･記入要領」2.を参照）
	基盤研究（C）	1・2	←

ふりがな	C.W. びるぶらんと	所属研究機関・部局・職	会津大学・コンピュータ理工学部・助教授
研究代表者氏名	C.W. Vilbrandt 印		

研究課題	高詳細デジタルデータを用いたデスクトップマニュファクチュア

研究経費（千円未満の端数は切り捨てる）

年度	研究経費(千円)	使用内訳（千円）				
		設備備品費	消耗品費	旅費	謝金等	その他
平成17年度	3,597	2,220	227	350	750	50
平成18年度	1,400	0	100	250	1,000	50
平成19年度	0	0	0	0	0	0
平成20年度	0	0	0	0	0	0
総計	4,997	2,220	327	600	1,750	100

研究組織（研究代表者及び研究分担者）（研究分担者も研究代表者としての資格を有する者であり、本研究計画に常時参加する者です。）

氏名(年齢)	所属研究機関･部局･職	現在の専門	学位	役割分担（本年度の研究実施計画に対する分担事項）	平成17年度研究経費	エフォート
					(千円)	(%)
C.W. Vilbrandt (59)	会津大学 コンピュータ 理工学部 助教授	高次元 モデリング	修士	主任調査員 兼 モデラー 兼 マルティメディア コーディネーター	3,597	72
研究協力者 Neal Gershenfeld (45)	Massachusetts Institute of Technology (MIT) / Center for Bits and Atoms / Director	応用物理 数学モデル化 情報物理学	博士 (Ph.D.)	研究協力者 兼 システム設計者 兼 チーフエンジニア		
合計 1 名				研究経費合計	3,597	

基盤研究(A・B・(C))	研究機関名	会津大学	研究代表者氏名	C.W. Vilbrandt

様式Ｓ－１－７

平成17年度 基盤研究(A･B･C)(一般)研究計画調書(新規)

注１．別途平成17年度基盤研究(A･B･C)(一般)研究計画調書作成･記入要領(鶯色)を参照してください。
注２．※印の欄は研究機関において記入してください。

※機関番号	
※整理番号	

基盤研究	A・B・(C)	審査区分	一般

審査希望部門	分野	分科	細目	細目番号(4ケタ)
	総合領域	情報学	メディア情報学・データベース	1004

分割番号		
総合・新領域系	(A)・B	← 分割番号が付されている細目を選択した場合，どちらかに必ず○を付すること(「作成･記入要領」2.を参照)
基盤研究（C）	1・2	←

ふりがな	C.W. ぴるぶらんと	所属研究機関・部局・職	会津大学・コンピュータ理工学部・助教授
研究代表者氏名	C.W. Vilbrandt 印		

研究課題	Desktop Manufacturing from Easily Transmitted High Resolution Digital Files 高詳細デジタルデータを用いたデスクトップマニュファクチュア

研究経費（千円未満の端数は切り捨てる）

年度	研究経費(千円)	使用内訳（千円）				
		設備備品費	消耗品費	旅費	謝金等	その他
平成17年度	3,597	2,220	227	350	750	50
平成18年度	1,400	0	100	250	1,000	50
平成19年度	0	0	0	0	0	0
平成20年度	0	0	0	0	0	0
総計	4,997	2,220	327	600	1,750	100

研究組織（研究代表者及び研究分担者）(研究分担者も研究代表者としての資格を有する者であり、本研究計画に常時参加する者です。)

氏名(年齢)	所属研究機関･部局･職	現在の専門	学位	役割分担(本年度の研究実施計画に対する分担事項)	平成17年度研究経費(千円)	エフォート(%)
C.W. Vilbrandt (59)	会津大学 コンピュータ理工学部 助教授	高次元モデリング	修士	主任調査員 兼 モデラー 兼 マルティメディア コーディネーター	3,597	72
研究協力者 Neal Gershenfeld (45)	Massachusetts Institute of Technology (MIT) / Center for Bits and Atoms / Director	応用物理 数学モデル化 情報物理学	博士 (Ph.D.)	研究協力者 兼 システム設計者 兼 チーフエンジニア		
合計 1 名				研究経費合計	3,597	

基盤研究(A・B・C)	研究機関名	会津大学	研究代表者氏名	C.W. Vilbrandt

「研究計画最終年度前年度の応募」(公募要領13頁を参照)として新規応募する場合のみ記入

研究計画最終年度前年度の応募の概要

研究代表者として行っている特別推進研究及び基盤研究のうち研究期間が４年以上で、かつ、平成17年度が最終年度に当たる研究課題の当初研究計画及びこの研究によって得られた新たな知見等の研究成果について具体的かつ明確に記入してください。

研究種目名	審査区分	課題番号	研究課題名	研究期間
				平成　年度～ 平成17年度

特別推進研究又は基盤研究による研究計画及び研究成果

研究計画最終年度前年度の応募をする理由

研 究 目 的

（①科学研究費の交付を希望する期間内に何をどこまで明らかにしようとするのか、
②当該分野におけるこの研究(計画)の学術的な特色・独創的な点及び予想される結果と意義、
③国内外の関連する研究の中での当該研究の位置づけ、
④平成17年度において継続して科学研究費補助金以外の研究費（他府省・地方公共団体・研究助成法人・民間企業等からの研究費）の助成を受ける場合は、当該継続研究課題と本研究課題との相違点、
について焦点を絞り、具体的かつ明確に記入してください。）

1. Statement of Intent

During the proposed period, we will research and develop software and hardware systems that can rapidly (in minutes and hours) and locally create real, tangible, functional objects from intangible digital computer models. Our fundamental interest is the idea of "digital" manufacturing based on building with logic, and its application in personal manufacturing analogous to personal computers. This means logic, sensing, actuation, communication, and displays in addition to 3D shapes and constructions. The proposed development of ***Personal Fabrication*** **(PF)** systems corresponds to the reduction in size and cost of personal computers from high cost specialized machines, the size of rooms, to common consumer machines readily available at commodity prices. Current research in this field has resulted in Rapid Prototyping, the creation of tangible but rarely functional 3D objects from digital computer models.

We intend to build on the current state of the art in three major ways:

1) The rapid, local creation of functional, usable, mechanical and electronic objects (clocks, cell phones, bikes, small computers / prototype computing devices, controllers, sensors, robots, Internet devices, car parts, musical instruments, cutting/milling smart lighting, antennas, radios, wearable computers, smart clothing, etc.).
2) In order to achieve the above in a practical and efficient way, we will further our ongoing research (see page 4, Section II, HyperFun applet) in mathematical modeling based on continuous functions in a point wise hyper volume construction defining mixed materials and complex objects with a compressed format suitable for Internet transmission.
3) Lower the overall "Total Cost of Ownership" (TCO) and environmental impact, thus allowing for the future creation of desktop 3D manufacturing similar to the desktop printing revolution of the early 1990s.

At the end of the research time frame, the goal is a fully functional system, which we call the Personal Fabrication System, that can manufacture a variety of user goods, including both mechanical and electronic products from digital computer models.

2. Details and Goals of the Research

Our initial aim is to create a research and learning environment that is quite broadly based, practical, and hands-on by going to the next step in digital evolution and implementing a Personal Fabrication Facility (rapid on-demand manufacturing) where an individual, using a personal computer and design software or an Internet browser accessing an on-line modeling program, can easily create 3D virtual designs and locally manufacture on demand the consequent real and precision based objects. After establishing the Personal Fabrication Facility, we will act effectively to set open hardware and software standards for design and creation of inexpensive 3D printers and PF machines.

Our specific goals over the next two years are:

- Personal Fabrication test bed facility for implementing and debugging the digital fabrication processes and technology.
- Lower Total Cost of Ownership (TCO).
- Lower energy requirements.
- Easy and safe fabrication tools.
- Use of inexpensive, non-toxic, reusable and recyclable, tough, broad / varied (liquid proof, electrical, etc.) base materials.
- Multi-material fabrication.
- Open standards and interchangeable media and data.
- Open, extensible, and modifiable general interface and constructive geometry engine.
- A programmable "on-chip" open standard language interface and geometry engine "ripper".
- Fabrication design software and friendly user interface.
- Inexpensive, multi-material, 3D desktop fabricators.

3. Significance and Potential Impact of the Research

Imagine a world where information has no boundaries and flows freely between bits and atoms, where information provides greater individual power and freedom than ever before and is easy to acquire - a world where the digital and the physical overlap and become interchangeable, where the consumer society will be replaced by the fabrication society.

The creation of inexpensive, environmentally friendly desktop fabrication (PF) has the potential to impact science and society much as the personal computer. Personal Fabrication will usher in a whole new way of thinking from buying customized products, e.g. tennis shoes manufactured in your home rather than purchased from a remote manufacturer, to small design groups being able to instantly test and implement new circuit designs and chips. In reality, we can envision an economic environment where we buy designs rather than products and personally manufacture our own unique products. The computer and Internet revolution have had such a tremendous impact because they allow a large number of people to be involved directly in the creative process of the programming, manipulating and designing of bits. In the coming years, we will see a parallel revolution in the ability of everyday computer users to be involved in the creative process of designing, manipulating and fabricating tangible products – from bits to atoms!

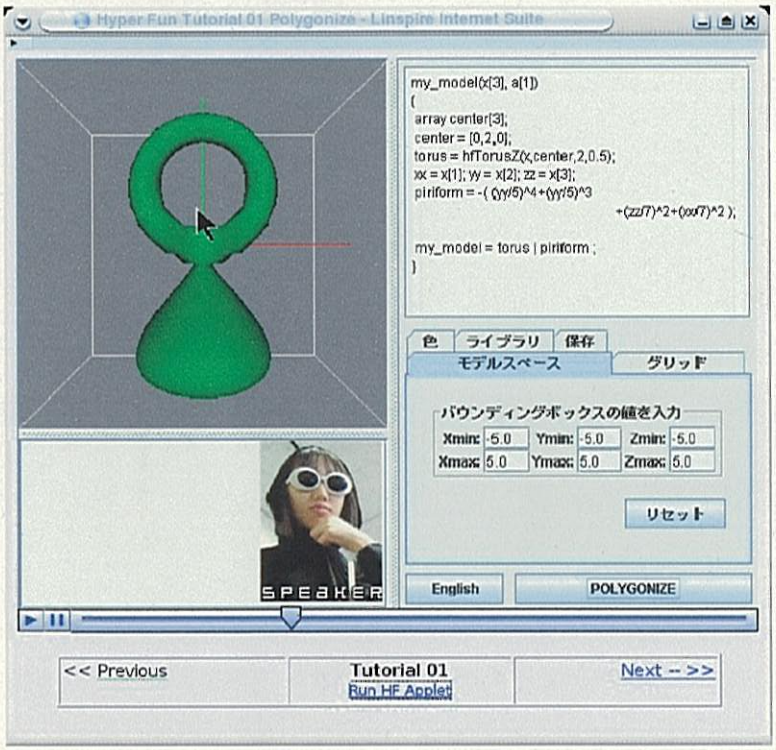
従来の研究経過・研究成果 〈Ⅰ及びⅡを区別するため、Ⅰを記入後は点線を引いて分けてください。〉

Ⅰ．この研究課題又はこれに密接に関連した研究課題で、研究代表者が従来受けた科学研究費補助金の研究種目、期間(年度)、研究課題名、研究経費を記入のうえ、それぞれの当初の研究計画、研究経過及び研究成果等について、具体的かつ明確に記入してください。
Ⅱ．Ⅰ以外で、この研究課題又はこれに密接に関連した研究課題で受けた、科学研究費補助金以外の研究費(所属研究機関より措置された研究費、他府省・地方公共団体・研究助成法人・民間企業等からの研究費を含む。)におけるそれぞれの研究経過・研究成果等について、名称、期間(年度)、研究課題名、研究者(研究代表者又は研究分担者)氏名、研究経費を記入のうえ、具体的かつ明確に記入してください。

なお、従来受けた研究費には現在遂行中の研究も含みます(ただし、2頁目の研究計画最終年度前年度の応募に記載のものは除く)。

II. Fukushima Foundation for the Advancement of Science and Education 2004, "Personal Fabrication"
The goal is the development of a learning environment which is a broadly based, practical education experience by going to the next step in digital evolution, that is to set up a rapid-prototyping, personal fabrication mini facility. In such a facility, a person using an Internet browser can access online the HyperFun Modeling Program model creation applet (http://www.u-aizu.ac.jp/~vilb/HF/) to easily create a 3D virtual design and then, using their design, fabricate a tangible, precision object/product. The research question to be answered is how applicable is personal fabrication to University of Aizu students and the local community as a practical educational experience for acquisition of digital literacy.

Budget of 700,000 Yen, funding to be released November 2004.



HyperFun Modeling Program model creation applet (left) and desktop milling machine (below).

University of Aizu Competitive Research Funding 2004 (General Research Category), "Bits to Atoms"

The purpose of the research is to build a fabrication facility to "test bed" fabrication processes and technology, research and suggest new key technologies with emphasis on medical simulation and monitoring devices, enhance current technology, educate and promote the adoption of open digital fabrication standards.

Goal :

- Purchase and installation of 3D printer and set up digital fabrication facility at the University of Aizu.
- Create real physical objects from the University of Aizu's extensive repository of medical data for medical simulation and digital cultural heritage data from cultural properties of the local Aizu region.
- Create a curriculum based on the design and manufacturing of real objects from digital structures.
- Create rings or circles that will initiate students and researchers to create objects of their own design.
- Scan objects created with the system, thereby returning them to digital formats and establishing a fine grain, closed control loop.

Budget of 3,200,000 Yen, funding released October 2004.

Consultation with vendors for purchase of 3D rapid prototyping equipment is in process.

準備状況等 〈Ⅰ～Ⅲを区別するため、点線を引いて分けてください。〉

Ⅰ．この研究課題の準備状況等について、焦点を絞り、具体的かつ明確に記入してください。
なお、この研究課題に密接に関連した研究課題の成果を発展させる場合は、そのことについて記入しても差し支えありません。
Ⅱ．研究を実施するために使用する研究施設・設備等、現在の研究環境の状況について記入してください。
Ⅲ．海外共同研究者がいる場合の相手国研究者との連絡調整の状況など、研究着手に向けての状況について記入してください。

I. Research Background and Future Outcomes

The principal investigator has been working in manufacturing materials and processes for over thirty years and digital processes for over twenty. As of 2004, a research group has been established in Japan in collaboration with the Massachusetts Institute of Technology (MIT) Media Lab / Center for Bits and Atoms in Boston, Massachusetts, U.S.A., for the express purpose of Personal Fabrication. The Japan based research group has an original modeling source code library already created over a period of years and hosted by the internationally recognized open source, Concurrent Version System (CVS) digital conservatory and development consortium, Sourceforge.net. This original modeling library will be used as the base for the Personal Fabrication modeling environment and software. Our joint research with the MIT Media Lab / Center for Bits and Atoms will be a key element as a future foundation for robust fabrication system development.

II. Research Facilities and Locations

The primary research will be located at the Computer Arts Lab, Department of Computer Information Systems, University of Aizu, a specialized computer university and as such uniquely adapted for this type of research in Japan. The Computer Arts Lab has been an important element in the university's focus on the materials and processes of digital media and open learning systems. By understanding and leveraging the strengths of digital materials, the Computer Arts Lab of the University of Aizu has been able to provide solutions to difficult issues such as long term digital archiving for historical preservation of cultural heritage properties, see "Cultural Heritage Preservation Using Constructive Shape Modeling," *Computer Graphics Forum* (March 2004).

III. Overseas Collaborators

Additionally, the Center for Bits and Atoms located at the Massachusetts Institute of Technology (MIT), Boston, Massachusetts, U.S.A., will be collaborating with the Computer Arts Lab. The Center for Bits and Atoms was founded by Profs. Isaac Chuang, Neil Gershenfeld, Joseph Jacobson, and Scott Manalis, with Marvin Minsky. It was launched by a National Science Foundation award in 2001, supporting the creation of a unique shared experimental resource that enables the creation of form and function across nine orders of magnitude in length scales, as well as an associated intellectual community drawn from across MIT's campus spanning the historical divisions that have emerged between the study of computer science and physical science, and between the development of software and hardware. The MIT Center for Bits and Atoms' government funding is complemented by strong corporate sponsorship for technology development and transfer.

Attached to this application is a letter of confirmation to collaborate in joint research with the Computer Arts Lab of the University of Aizu on the part of the MIT Center for Bits and Atoms, authorized by Dr. Neal Gershenfeld, Director of the Center. All communication regarding the research between the University of Aizu and the Center will be in English. Research data and corresponding communications will be exchanged electronically and over the Internet.

Dr. Neil Gershenfeld's numerous academic publications in computing and physics, such as his best selling books, ***Physics of Information Technology*** (2000), ***The Nature of Mathematical Modeling*** (1998) – both Cambridge University Press, and ***When Things Start to Think*** (1998), may be found through traditional and digital library searches. His work has been featured by the White House and Smithsonian Institution in their Millennium celebrations, and has been the subject of print, radio, and TV programs in media including the New York Times, The Economist, CNN, and the U.S. Public Broadcasting System.

Dr. Gershenfeld's willingness to mentor this project with his considerable expertise and research backed by a $13 million grant received in 2002 from the U.S. National Science Foundation helps to secure a certain success for this project.

研究分担者に分担金を配分する必要性 （公募要領８頁を参照）

研究代表者と異なる研究機関に所属する研究分担者に、例えば、遠隔地に所在する研究機関において実施する一定規模の分担研究などのため、研究費の一部を配分し、当該研究分担者の所属研究機関において経理管理を行わないと分担部分の研究実施が困難な理由を必ず記入してください。

研究計画・方法 〈平成17年度の計画と18年度以降の計画に分けて記入してください。
また、Ⅰ及びⅡを区別するため、Ⅰを記入後は点線を引いて分けてください。〉

Ⅰ.研究目的を達成するための研究計画・方法について
①研究代表者・研究分担者の相互関係(役割分担状況)も含めて研究計画・方法を具体的に記入してください。
また、②特に初年度については、例えば、主要設備(現有設備を含む)との関連、旅費については調査予定地域や実施体制、また、謝金等については人数や支援の内容など、経費と研究計画との関連性についても記入してください。③研究計画のいずれかの年度において、「設備備品費」、「旅費」又は「謝金等」のいずれかの経費が90%を超える場合(公募要領7頁を参照)には、当該経費の研究遂行上の必要性について記入してください。さらに、④海外共同研究者(公募要領7頁を参照)との共同研究を含む場合には、その必要性及びこれらの者とどのように共同して研究を実施していくのかについて記入してください。
Ⅱ.生命倫理・安全対策等に関する留意事項(該当者のみ)
ヒト遺伝子解析研究、社会的コンセンサス等を必要とする研究及び生命倫理・安全対策に対する取組が必要とされている研究については、対策としてどのような措置を講じようとしているのか具体的に記入してください。

研究計画・方法 (平成１７年度)

I. ① Plan and Structure and ② Outline of First Year Budget and Plan

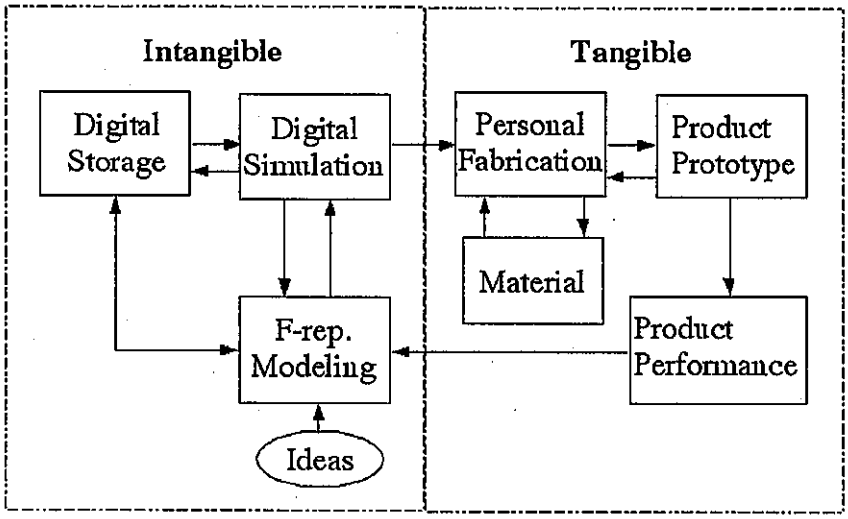


Figure 1: Virtual to Physical Transformation Process in the Personal Fabrication System.

The bulk of the proposed budget will be used to setup a fabrication research facility, called a 'Fab Lab', for the research, design and testing of the Personal Fabrication System (Fig. 1 above). The 'Fab Lab' is designed using relatively low-cost, off-the-self hardware components to create an affordable, rapid manufacturing facility that will allow the research to further extend the Personal Fabrication System's capabilities and usefulness as the research progresses. During the research, the Computer Arts Lab should hire one part-time technician/programmer to coordinate and oversee several other collaborating graduate studies research programmers. The technician/programmer would be working solely under the direction of the Computer Arts Lab. This proposal is expected to act as a starting point for more long term research on Personal Fabrication and collaboration with the MIT Center for Bits and Atoms.

The two year research term can be divided into three major areas:

I. Creation and operation of a simple, basic 'Fab Lab' as a foundation (with current available hardware and software).

II. Coding of new software tools that will aid in and streamline the general fabrication process with an emphasis on the creation of multi-material objects (which to date has not been effectively done).

III. Creation of a robust specification and design for inexpensive, fast, efficient, eco-friendly, multi-material fabricators and an open standards group for Personal Fabrication.

The following is specific list of tasks categorized by each of the three major areas listed above. [Task 1 begins in fiscal 2005, and Task 10 ends at the end of fiscal 2007, see Fig. 2 below].

I. Establishing a working 'Fab Lab'

Task 1 – Purchase and installation of a Personal Fabrication (PF) facility in a Aizu.

Task 2 – Make practical, useful objects or prototypes that can be used, testing the facility as built.

Task 3 – Establish a curriculum and circles to encourage individual design and object creation with the 'Fab Lab' in order to predict and understand needs and problems with the system.

II. General and Open Geometry Engine and Design Standard for Personal Fabrication

Task 4 – Use architecture and code already created by the Computer Arts Lab to finish the development of a robust, extensible, geometry engine framework.

Task 5 – Create a software tool and interface for designing simple objects to start that can be readily fabricated using this geometry framework for PF.

Task 6 – Create a CNC tool path exporter for the software tool to be used on the ROLAND/3D Mill and Scanner.

研究計画・方法 （平成１７年度（つづき））

Task 7 – Lay the foundation and design of the geometry engine so that it may be placed on a microchip to be used by PF machines.

III. New Personal Fabrication Machines

Task 8 – Create a working open standards group for PF with invitations to academics as well as industry.

Task 9 – Investigation into research and development for the discovery and creation of new robust, environmental materials for use in multi-material fabricators.

Task 10 – Begin to set the specifications and design for inexpensive, fast, eco-friendly, multi-material fabricators.

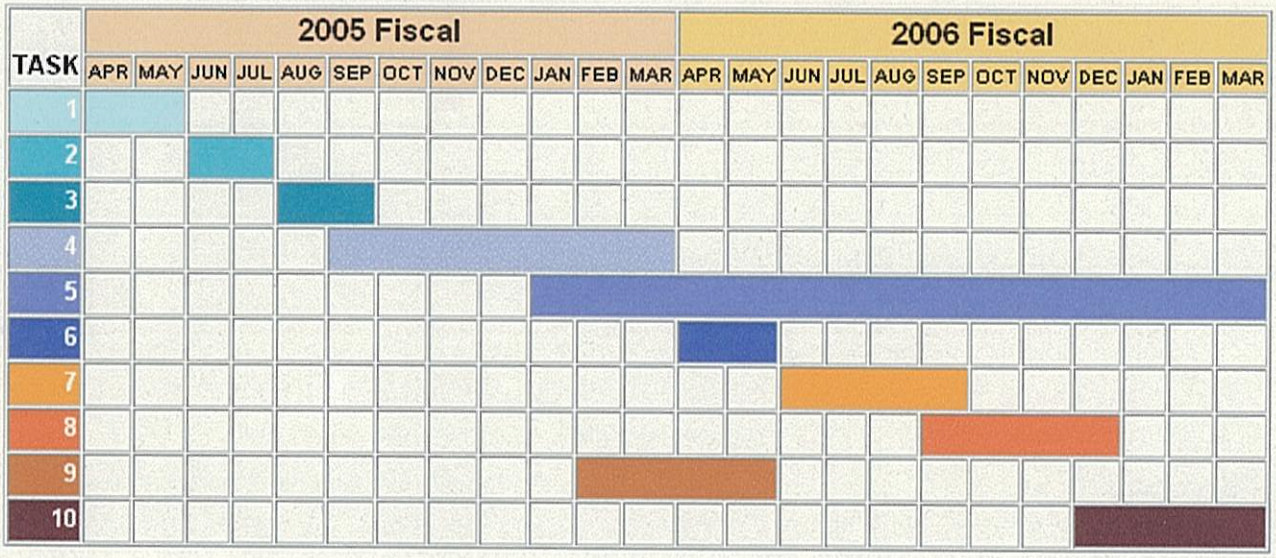


Figure 2: Schedule of Research Tasks / Milestones.

The Computer Arts Lab at the University of Aizu will assume the bulk of the research as follows:

- Creation of Personal Fabrication facilities.
- Constructive based fabrication and design software.
- Open standards and ethical communities and rules for Personal Fabrication and synthetic environments.

The Center for Bits and Atoms, MIT, Boston, USA, will provide the following:

- Connectivity to the largest community of fabrication specialists in the world.
- Specific fabrication hardware created by the MIT Center for Bits and Atoms.
- A test bed for software created by the University of Aizu Computer Arts Lab.
- Joint creation with the Computer Arts Lab of a open standards group for PF.

I. ④ Overseas Collaboration

Researchers at MIT will be integral in helping to provide tools and setup an initial 'Fab Lab'. In addition, they will be aiding in design and testing of software developed at the Computer Arts Lab. The developed software will be provided to several classes being taught at MIT for real world testing and evaluation by MIT students and faculty. Furthermore, the Computer Arts Lab will be learning and benefiting from the collective knowledge of other established Personal Fabrication facilities around the world which the MIT Center for Bits and Atoms has initiated and directed in an effort to reduce the costs and environmental impact of PF.

During this research, at least once per year, a representative visit by the Computer Arts Lab will be made to the Center for Bits and Atoms at MIT in Boston, Massachusetts. An initial meeting in early 2005 will take place in Tokyo (to accommodate other contributing members of the Japan based research group affiliated with academic institutions spread throughout Japan) and at the University of Aizu to coordinate the research between the University of Aizu and MIT. All travel expenses of the collaborating teams not directly affiliated with the University of Aizu are not to be covered by this proposal and are expected to be provided by the visiting researchers themselves.

All communication regarding the research between the University of Aizu Computer Arts Lab and the MIT Center for Bits and Atoms will be in English. Research data and corresponding communications will be exchanged electronically and over the Internet. An active online archive, CVS server and groupware website will serve as additional support between the Computer Arts Lab and the MIT Center for Bits and Atoms.

研究計画・方法 （平成１８年度以降）

Outline of Second Year Budget and Plan

As can be seen from Figure 2 on page 7, the second year will focus on the creation of the software tools and interface for the geometry engine framework. In Tasks 5 and 6, we begin with creating a modeling interface to design simple objects, then creating the interface to mill and scan the designs on the ROLAND 3D Mill and Scanner. By the middle of the second year, we begin laying the foundations and design of the geometry engine for a microchip to be used on Personal Fabrication machines. Toward the end of that phase, we begin to create an open standards group for Personal Fabrication Systems. Lastly, we should set specifications and publish our results after visiting and discussion with the MIT Center for Bits and Atoms.

(金額単位:千円)

設備備品費の明細 (多数の図書、資料を購入する場合は「西洋中世政治史関係図書」のようにある程度、図書、資料の内容が判明するような表現で記入してください。)			消耗品費の明細	
年度	品名・仕様 (数量×単価) (設置機関)	金額	品名	金額
17	Durables purchased by and for the University of Aizu / Computer Arts Lab:		Consumables purchased by and for the University of Aizu / Computer Arts Lab:	
	ROLAND/3D Mill and Scanner 1 x 480 (会津大学)	480	WAVETEK/Multimeter 1 x 23	23
	ROLAND/Vinyl Cutter 1 x 310 (会津大学)	310	B&K Precision/Function Generator 1 x 35	35
	TEKTRONIX/Oscilloscope 1 x 230 (会津大学)	230	MIT/RF Analyzer 1 x 22	22
	MIT/Tower Kit 1 x 300 (会津大学)	300	MIT/UV-VIS spectrometer 1 x 30	30
	iWill/Dual PC 2 x 250 (会津大学)	500	INTEL/Microscope 1 x 35	35
	CANNON/HD Digital Camera 1 x 400 (会津大学)	400	HP/Flatbed Scanner 1 x 32	32
			Raw materials / media for fabrication	50
	計	2,220	計	227
18			Raw materials / media for fabrication	100
	計	0	計	100

基盤研究(A・B・C)	研究機関名	会津大学	研究代表者氏名	C.W. Vilbrandt

(金額単位:千円)

旅費等の明細 (記入に当たっては、基盤研究(A・B・C)(一般)研究計画調書作成・記入要領を参照してください。)

年度	国内旅費		外国旅費		謝金等		その他	
	事項	金額	事項	金額	事項	金額	事項	金額
１７	調査・研究旅費 研究打合せ旅費 成果発表 計	 100 100	調査・研究旅費 研究打合せ旅費 成果発表 計	250 250	研究補助 専門的知識の提供 資料提供・閲覧 外国語論文の校閲 計	750 750	計算機使用料 機器のレンタル料 会議費 印刷費 研究成果投稿料 研究支援者雇用費 (内訳:○人×延べ○月 計	 50 50
18	調査・研究旅費 研究打合せ旅費 成果発表 計	 	調査・研究旅費 研究打合せ旅費 成果発表 計	250 250	研究補助 専門的知識の提供 資料提供・閲覧 外国語論文の校閲 計	1,000 1,000	計算機使用料 機器のレンタル料 会議費 印刷費 研究成果投稿料 研究支援者雇用費 (内訳:○人×延べ○月 計	 50 50

研 究 業 績

最近５カ年間に学術誌等に発表した論文、著書のうち本計画に関連する重要なものを選定し、研究組織欄に記入された研究者ごとに、現在から順に発表年次を過去にさかのぼって記入してください。なお、この頁で記入できない場合は、裏面を使用してください。

研究代表者・分担者氏名 (所属研究機関・部局・職)	発表論文名・著書名 (論文名、著書名、著者名、学協会誌名、巻(号)、最初と最後のページ、発表年(西暦)について記入してください。) (以上の各項目が記載されていれば、項目の順序を入れ替えても可。著者名が多数にわたる場合は、主な著者を数名記入し以下を省略(省略する場合、その員数と、掲載されている順番を○番目と記入)しても可。なお、研究代表者及び研究分担者にはアンダーラインを付すこと。)
C.W. Vilbrandt (会津大学・ コンピュータ理工学部 ・助教授)	**PROCEEDINGS:** • C. Vilbrandt, D. McLaughlin, **"Aizu Cultural Heritage and Digital Technology,"** 10th International Conference on Virtual Systems and Multimedia – VSMM 2004, November 2004, Softopia, Ogaki City, Gifu, Japan, H. Thwaites (Ed.), pending. • K. Kimura, C. Vilbrandt, **"Independent Lightweight 3D Graphics for Mobile Phones,"** 4th International Conference on Computer and Information Technology – CIT 2004, September 14-16, Wuhan, China, IEEE Computer Society, D. Wei et al. (Eds.), ISBN 0-7695-2216-5, pp. 562-568. • T. Vilbrandt, C. Vilbrandt, et al., **"Making It Realtime: Optimized Realtime Frameworks for Education and the Web,"** 3rd IASTED International Conference on Visualization, Imaging, and Image Processing, September 2003, Benalmádena, Spain, ACTA Press Canada, M.H. Hamza (Ed.), ISBN 0-88986-382-2 (396-1), Vol. 2. • C. Vilbrandt, A. Pasko, P. Fayolle, et al., **"STAR Report: Reverse Construction of Cultural Heritage,"** 13th International Conference on Computer Graphics and Vision - GraphiCon-2003, September 5-10, Moscow State University, Eurographics Association, ISBN 5-317-00788-7, pp. 22-30. • C. Vilbrandt, A. Pasko, P. Fayolle, et al., **"Alternatives to Metadata for Cultural Heritage Objects,"** CIDOC/ADIT 2003 (Comité international pour la documentation / Russian Association for documentation and information technologies), September 1-5, State Russian Museum (Marble Palace), St. Petersburg, Russia, ICOM-CIDOC, L. Kurenkova (Ed.), pp. 86-87. • T. Yamamoto, C. Vilbrandt, **"Parallel HyperFun Polygonizer,"** ISPA 2003 - LNCS 2745, International Symposium Parallel and Distributed Processing and Applications, July 2003, Aizu-Wakamatsu, Japan, Springer-Verlag Berlin, M. Guo and L.T. Yang (Eds.), ISBN 3-540-40523-2, pp. 329-345. • M. Shanat, P. Fayolle, C. Vilbrandt, et al., **"Haniwa: A Case Study of Digital Visualization of Virtual Heritage,"** The 20th Eurographics UK Conference, IEEE Computer Society Press, 2002, ISBN 0-7695-1518-5, pp. 24-32. • C. Vilbrandt, C. Calef, et al., **"Making It Realtime: Exploring the use of optimized realtime environments for historical simulation and education,"** 6th International Conference of Museums and the Web 2002 (April 2002, Boston, MA, USA), Archives & Museum Informatics, D. Bearman (Ed.), ISBN: 1-885626-25-1. • C. Vilbrandt, J.M. Goodwin, A. Pasko, et al., **"Dancing Buddhas: New Graphical Tools for Digital Cultural Heritage,"** 7th International Conference on Virtual Systems and Multimedia VSMM'01 (25-27 October 2001, University of California Berkeley, USA), IEEE Computer Society, ISBN 0-7695-1402-2, 2001, pp. 345-353. • C. Vilbrandt, A. Pasko, G. Pasko, J.R. Goodwin, J.M. Goodwin, **"Digital Preservation of Cultural Heritage through Constructive Modeling,"**International Cultural Heritage Informatics Meeting ichim01 (3-7 September 2001, Politecnico di Milano, Italy), European Commission IST (Information Society Technologies) Programme, D. Bearman and F. Garzotto (Eds.), Vol. 1, 2001, ISBN 1-885626-24-X, pp. 183-200. • G. Pasko, A. Pasko, C. Vilbrandt, T. Ikedo, **"Virtual Shikki and Sazaedo: Shape Modeling in Digital Preservation of Japanese Lacquer Ware and Temples,"** Spring Conference on Computer Graphics SCCG 2001 (25-28 April 2001, Budmerice, Slovakia), IEEE Computer Society, R. Durikovic, S. Czanner (Eds.), ISBN 0-7695-1215-1, 2001, pp. 147-154.

研 究 業 績 (つづき)

研究代表者・分担者氏名 (所属研究機関・部局・職)	発表論文名・著書名 (論文名、著書名、著者名、学協会誌名、巻(号)、最初と最後のページ、発表年(西暦)について記入してください。)
C.W. Vilbrandt (会津大学 ・ コンピュータ理工学部 ・助教授)	• C. Vilbrandt, J.M. Goodwin, J.R. Goodwin, **"Digital Digging: Computer Models of Archaeological Sites: Enchiji in Aizu, Japan,"** 2001 PNC Pacific Neighborhood Consortium Annual Conference and Joint Meetings (15-20 January 2001, Hong Kong), Computing Centre, Academia Sinica, Taiwan, R.O.C., 2001, CD-ROM. • C. Vilbrandt, J.M. Goodwin, J.R. Goodwin, **"Computer Models of Historical Sites: Sazaedo - From the Aizu History Project,"** 1999 EBTI, ECAI, SEER & PNC Joint Meeting (18-21 January 1999, Academia Sinica, Taipei, Taiwan, R.O.C.), PNC Secretariat (Ed.), ISBN 957-671-626-8, 1999, pp. 489-502. **JOURNALS:** • C. Vilbrandt, **Computer Aided Design's eXtended Dimensions,** *Journal of Hyper(+)drome.Manifestation*, peer-reviewed electronic journal of critical discourse on the impact of discontinuous socio-technological change, Vol. 1 (September 2004). • C. Vilbrandt, A. Pasko, et al., **"Cultural Heritage Preservation Using Constructive Shape Modeling,"** *Computer Graphics Forum*, Eurographics Association, Blackwell Publishing Ltd, Oxford, England, D. Duke and R. Scopigno (Eds.), ISSN 0167-7055, Vol. 23, No. 1 (March 2004), pp. 25-43. • C. Vilbrandt, **"Introduction to Extending the Freedoms of Free and Open Information,"** *Journal of Shanghai University* (English Edition), University of ShanghaiPress, Shanghai, China, ISSN-1007-6417, Vol. 5, Suppl. (Sep. 2001), pp. 181-188. • G.Pasko, A. Pasko, C. Vilbrandt, T. Ikedo, **"Shape Modeling Issues of Digital Preservation of Japanese Lacquer Ware and Temples,"** *Computer Graphics and Geometry*, V. Pilyugin (Ed.), Scientific Electronic Library, ISSN 1811-8992, Vol. 3, No. 3, 2001. • S. Vyatkin, S. Chizhick, C. Vilbrandt, **"Dynamic Distortion Correction with Viewpoint Motion and Non-Static Attitude of Projector,"** *Computer Graphics and Geometry*, V. Pilyugin (Ed.), Scientific Electronic Library, ISSN 1811-8992, Vol. 3, No. 1, 2001. **BOOKS:** • 魏大名 先田和弘 R. Durikovic 向井信彦 C. Vilbrandt, **IT Text – ンピュータグラフィックス**, Ohmsha Ltd, Tokyo, Japan, 2003, ISBN 4-274-13288-9, pp.237-248, 255, 261-262.

様式Ｓ－４－４

研究代表者の所属研究機関において記入する事項	機関番号	
	整理番号	

平成１７年度科学研究費補助金応募カード（学振）

（記入に当たっては「平成１７年度科学研究費補助金応募カード（学振）作成・記入要領」に基づき記入してください。）

研究代表者が記入する事項

１．研究種目（該当する研究種目を○で、「基盤研究」及び「若手研究」についてはアルファベットも○で囲むこと）

（ 基盤研究（Ｓ・Ａ・Ｂ Ｃ）・ 萌芽研究 ・ 若手研究（Ａ・Ｂ） ）

２．審査区分（基盤研究（Ａ・Ｂ・Ｃ）のみ、該当する番号を記入）

1

「一般」：１　「企画調査」：２　「海外学術調査」：３

３．細目（該当する細目番号（「海外学術調査」は関連する細目番号）を記入）

1	0	0	4

（４ケタ）

４．分割番号（総合・新領域系のみ）

A

分割Ａ：Ａ
分割Ｂ：Ｂ

５．分割番号（基盤研究（Ｃ）「一般」のみ）

分割１：１
分割２：２

６．研究対象の類型（基盤研究（Ｃ）「企画調査」のみ）

（１、２又は３を記入）

７．分野（「海外学術調査」のみ、該当する番号を２ケタで記入）

「人文学Ａ」：０１　「人文学Ｂ」：０２　「社会科学Ａ」：０３　「社会科学Ｂ」：０４
「数物系科学Ａ」：０５　「数物系科学Ｂ」：０６　「化学」：０７　「工学」：０８
「生物学」：０９　「農学」：１０　「医歯薬学Ａ」：１１　「医歯薬学Ｂ」：１２

８．研究課題（４０字以内で記入）

高	詳	細	デ	ジ	タ	ル	デ	ー	タ	を	用	い	た	デ	ス	ク	ト	ッ	プ
マ	ニ	ュ	フ	ァ	ク	チ	ュ	ア											

９．研究代表者氏名（記名押印又は署名）

（ふりがな）　C.W. びるぶらんと

氏　名　C.W. Vilbrandt　印

１０．研究代表者の研究者番号

1	0	3	1	5	6	8	2

１１．所属部局（学部等）・職

部局名：コンピュータ理工学部

所属部局番号

4	1	9

職名：助教授

職番号

2	1

１２．研究経費（１マスに１文字を右詰めで記入、応募のない年度は「０」を記入）

平成１７年度		3	5	9	7	千円
平成１８年度		1	4	0	0	千円
平成１９年度					0	千円
平成２０年度					0	千円
平成２１年度					0	千円

１３．平成１７年度分担金配分の有無

2

「有」：１　「無」：２

１４．研究者数（右詰めで記入）

	1

人

１５．【継続分の研究課題番号】
（大幅な変更がある場合のみ）

１６．開示希望の有無（該当する番号を記入）

1

「審査結果の開示を希望する」：１
「審査結果の開示を希望しない」：２

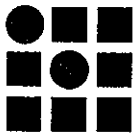
１７．【研究計画最終年度前年度の応募】（公募要領１３頁を必ず参照してください）

2

←「応募する」：1→

（平成１７年度が研究期間の最終年度に当たる研究計画の課題番号を記入）

「応募しない」：２
（該当しない場合）



THE CENTER FOR BITS AND ATOMS

Prof. Neil Gershenfeld, Director • Massachusetts Institute of Technology

April 21, 2004

Computer Arts Lab
Associate Professor Carl Vilbrandt
University of Aizu
Tsuruga, Ikki-machi,
Aizu-Wakamatsu-shi,
Fukushima-ken, Japan
965-8580

This is to confirm that MIT's Center for Bits and Atoms is interested in collaborating with the Computer Arts Lab in joint research on personal fabrication. We together seek to develop and deploy hardware and software tools to enable end-users to create as well as use information technologies, including the fabrication of three-dimensional structures, logic, sensing, actuation, and displays. These capabilities would be deployed in field "fab labs" in the Aizu valley. We fully support this effort, and expect to join the Computer Arts Lab in grant applications in Japan and the US.

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