RoBook Scanner

(*Robotics applications to Book Digitization)*

Phase 1: DIY Book Scanning Machine
Phase 2: Automatic Planetary Scanning Machine
Phase 3: Robot Book Scanning Machine

Proposed by:

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Project Executive Overview:

The main purpose is to digitize all rare documents, informational materials and books of all formats deposited or archived in the University. The need to build a fully automatic high grade digital scanning machine that will feature robustness, portability ,cheap cost of both hardware & Software and a quality fast image processing machine-- A “ RoBook Scanner “

Project Significance:

One of the primary purposes of digitization is to make documents available for on-line reading .RoBook Scanner is a project focused on building a low-cost digitization solution that will allow for rare materials held in collections without large budgets, and other scholarly content to be digitized into a high-quality PDF format. This project will have 2 (two) phases incorporating the hardware and software necessary components to accomplish this goal. First phase is the building of a book scanning machine and the second phase is the book scanning machine with automatic page turner.

Scholarly content materials need to be online, and for much mass produced content, that migration has happened. Unfortunately, the online presence of scholarly content is much more sporadic for long tail material such as small journals, original source materials in the humanities and social sciences and a lot more. A significant barrier to this content being available is the cost and complexity of setting up a digitization project for small and scattered collections coupled with a lack of revenue opportunities to recoup those costs. Collections with limited audiences and hence limited revenue opportunities are nonetheless often of considerable scholarly importance within their domains. The expense and difficulty of digitization presents a significant obstacle to making paper archives available online.

A capture process is needed that is fast, able to deal gently with diverse materials and resilient to operator error, paper quality, lighting variations and other factors. Our proposed pipeline will be modular and open, and all modules will be accessible so that any particular project could use whichever parts of the pipeline it needed. As a consequence of this project it will become feasible for any collection, no matter how small or how remote, to capture and preserve their materials for a very modest outlay in terms of equipment, and by utilizing local staff or volunteers. We believe that the quality of this software solution will also make it attractive to larger operations. To assemble a solution an institution must procure and assemble equipment, train operators, procure several pieces of software (some of which doesn't exist), and develop exception handling and QA processes and tools. All of these require specialized skills and knowledge that is not readily available and is quite arcane. It is really beyond the scope of the average institution, and it is expensive.

Even after capture process, the technology needed to convert the material is arcane; it requires expert users to configure it, and to develop workflows to deal with the exceptions that inevitably occur. For the targets of this project there are really no cost-effective solutions available at this time. There are several scan-to-PDF solutions available, foremost Adobe Distiller, but they are also costly and have serious limitations (e.g., they generate low quality text and do not reflow properly).

To meet this need we are building a RoBook Scanner. A RoBook Scanner will be an inexpensive portable /flexible hardware & software integration to scanning machine solution that can be readily procured and assembled and taken into the stacks or out into the field by local staff or volunteers to quickly and unobtrusively capture the material and deliver it in usable format. It will be open-source, easy to use, and will provide an out-of-the box method of digitizing small to medium archives of scholarly material.

A RoBook Scanner is a machine which is used to scan materials, integrating automated components that allow the device to exceed the speed of traditional manual imaging devices such as camera stands. A robotic scanner usually consists of three basic parts: a mechanical device to turn the pages; a cradle or table to hold the materials in place, and a camera or imaging sensor to capture images. Images are then automatically shuttled to a central computer repository, where automated processing may take place in order to perform cropping, de-skewing, and other image enhancement functions. During the process, the materials remain intact. Several high-end commercial robotic scanners use traditional air and suction technology while others take advantage of optical sensor technology to separate and turn pages one at a time. RoBook Scanner will address them all to produce a paper-to-digital document solution that is highly effective, highly automated, and low operator interaction (apart from page turning).

Background of Study:

Some old important scholarly content materials are need to be preserved and those are the main concern of the UP Diliman University Library -as much as possible keep and preserve these treasured “rare” materials. University Librarian archivists were classifying different types of materials: book, brochure, monograph and etc; then restored it in the Archives. But, somehow depositing rare materials in a certain place limit itself as an available preferences or resources to the patrons- because of its necessitates restricted or controlled use. The number or its quantities are limiting its availability unless there is a demand to produce a copy of these
- digitization. And it is possible as book scanning technology per se, but it is not always an easy option because it requires huge amount of library budgets. Other option is for the other imaging companies/parties (such as Kodak, Minolta) locally to offer a contract for the books scanning; yet the cost is very expensive. Since it is a project contract, and finishing the service on time matter most to the contractor, the quality of materials' replications are compromised resulting to some blurred, skewness and incomplete copy of its contents. One ideal recourse is to open an initiative to develop a scanning machine –RoBook Scanner

Document digitization is not easy. Much of the scholarly material that would benefit from this project is complex in layout. Library journals, with their multi- column layout, illustrations and complex lists and tables, auction catalogs, inventories and records, newspapers and news sheets, manuscripts and so forth contain images, multiple columns or boxes. The whole process, from initial image capture to a useful output, is arcane and messy with no guarantee of usable results. Though there has been an immense amount of high quality research in the document engineering field over the past two decades in both academia and industry, little of it has made it into real, deployed systems. Alternatives are discussed in Appendix 2, but note that none of them delivers a suitable solution.

Moreover, many of these documents found in the Archived are old, fragile, discolored, and in archaic typefaces. If the material is bound, then even flat- bed scanning will produce distorted images. Off-the-shelf packages such as the OCR packages are not particularly good in dealing with complex layouts, and the correction process is particularly tedious. This is unlikely to change as the market for OCR is not large, and the investment of the surviving commercial companies such as *Abbyy*, Nuance (*Scansoft)* is more oriented towards the more important goal of extending the languages covered than addressing the more esoteric layouts.

This RoBook Scanner project proposal was conceptualized because there is no commercial solution that is affordable, reliable and effective at digitizing content. We have assessed all of the readily available solutions and they all (irrespective of their claims) proved to be extremely expensive to acquire and operate, difficult to use and unreliable scanning machine. In several cases they were essentially unusable, are all expensive, they require extensive expertise to set up and operate, and they require a high degree of user intervention and expertise to operate. None of them provides a reasonable solution and none of them draws upon state of the art software technology now available.

RoBook Scanner project was developed for institutions or collections, with modest budgets, with material that is unique or fragile and must remain on-site, either because it is being used locally or there are restrictions on it being removed. Such institutions do not have sufficient material to justify the high set up costs of the overseas solution despite the low unit costs. In essence there are no cost effective digitization options available to the curators of small to medium sized collections.

RoBook Scanner will remove the barriers to digitization encountered by archives convened with cost of equipment, cost of labor, lack of digitization expertise, lack of suitable distribution formats, and lack of acceptable remediation work flows. RoBook Scanner will address them all to produce a paper-to -digital document solution that is highly effective, highly automated, and low operator interaction.

Project Research Problem:

The following Project Research Problems are:

The need to scan material by using computer vision techniques to produce flat, clean, searchable and widely usable page images which will be visually faithful to the original copy and allow the output to be viewable on mobile devices that supports PDF reflow.

The need to reduce or to remove almost all user intervention, in the capture and conversion process by using advanced document understanding techniques ,by detecting scan problems and by reducing the remainder to very simple "1-click" operations to rectify the scan instantly.

The need to remove for deep software, hardware or digitization skills by integrating all software components into a turnkey end-to-end solution.

The need to reduce or remove capital cost barriers: by using low cost but hi grade commercially available camera and by allowing volunteers or local staff to operate the system with minimal training.

The need to Build Book Scanning machine with automatic page turner-RoBook Scanner.

Project Objectives:

The solution will address these problem areas:

To scan material by using computer vision techniques to produce flat, clean, searchable and widely usable page images which will be visually faithful to the original copy and features to allow the output to be viewable on mobile devices that supports PDF reflow.

To reduce or to remove almost all users interventions, in the capture and conversion process by using advanced document understanding techniques ,by detecting scan problems allowing operator and by reducing the remainder to very simple "1-click" operations to rectify the scan immediately.

To remove the need for deep software, hardware or digitization skills by integrating all software components into a turnkey end-to-end solution.

To reduce or remove capital cost barriers: (1) by using low cost but hi grade commercially available camera and (2) by allowing volunteers or local staff to operate the system with minimal training.

To Build Book Scanning machine with automatic page turner-RoBook Scanner.

Project Related Literatures:

DIY Book Scanner from Trash and Cheap Cameras

This book scanner employs recycled, found, and salvaged materials at every step. I think it's important to note that this is not only because it is the right thing to do, environment friendly, when prototyping and building things, but also because the major thrust of this project is to make it affordable for almost anyone. Affordability often means getting creative with what you have and what you can find. One of the problems of building this way is that there is a strong stigma against recovering things from the trash. I'll admit that this affects even me on occasion. With that in mind, I want to show you a little dumpster diving trick that's socially acceptable. It's terribly simple. Take your camera, and hold it over the edge of any dumpster you find interesting. When you get home, see if there's anything that will help you. Later, return under cover of darkness and recover whatever it is you needed. I spent almost month thinking about this second book scanner and where to find stuff. During this month, I was vigilant about noting the locations of various construction dumpsters, and I also kept an eye on trashcans whenever I passed them. Whenever I saw something interesting, I made a simple decision. Should I grab it now, or simply photograph it? If it was a dumpster, I photographed it. If it was something useful, I grabbed it right away. It's good to keep a fabric shopping bag or backpack on you to transport all the stuff you will inevitably find.
-Daniel Reetz

Scan Robot

This scanner has been in preparation for at least 2 years and brings a new dimension to scanning. Fragile pages and delicate bindings may be safely scanned with this machine. Books are held in a walnut frame and opened to a maximum of 600 dpi during the scanning procedure. Page pickup and turning are delicately undertaken. A solid glass prism drops to the gutter depth and pages either side are gently sucked onto the prism. Both pages are scanned as the prism sucks vertically and upwards. This is a well designed scanner, robust and capable of long hours of un-interrupted working. An operator could oversee the operation of a number these robotic scanners. -*Treventuz*

BookDrive DIY

A scanner which is a cost-effective book digitization solution that combines the power of digital SLR cameras and the ingenuity of a unique v-shaped, auto-adjusting book cradle and platen to capture sharp images at up to 700 pages an hour. While conventional flatbed scanners and expensive overhead types tend to produce distorted images resulting from book bindings and page curvature and cause damage to books as a result of applying force in an attempt to flatten pages, BookDrive DIY produces sharp images with no page curvature and is easy on book bindings. Whether you are a small school, local library, university or imaging center, you can now afford an easy to use and highly efficient scanning solution. BookDrive DIY is the fastest and most affordable book digitization solution available today and because of its component based design it is entirely upgradeable.-*DIY Scanner ATIZ*

Decapod Scanner

Decapod is a project focused on building a low-cost digitization solution that will allow for rare materials, materials held in collections without large budgets, and other scholarly content to be digitized into a high-quality PDF format. This project will work to incorporate the hardware and software necessary to accomplish this goal. Decapod will be an inexpensive attaché case sized hardware/software solution that can be readily procured and assembled and taken into the stacks or out into the field by local staff or volunteers to quickly and unobtrusively capture the material and deliver it in usable format. It will be open-source, easy to use, and will provide an out-of-the box method of digitizing small to medium archives of scholarly material. Decapod will remove the barriers to digitization now encountered by archives of documentary material: cost of equipment, cost of labor, lack of digitization expertise, lack of suitable distribution formats, and lack of acceptable remediation workflows. Decapod will address them all to produce a paper-to-digital document solution that is highly effective, highly automated, and low operator interaction (apart from page turning).-*Fluid Decapod Project-2008*

Robotic Scanner

A robotic book scanner is a machine which is used to scan books, integrating automated components that allow the device to exceed the speed of traditional manual imaging devices such as camera stands. A robotic scanner usually consists of three basic parts: a mechanical device to turn the pages; a cradle or table to hold the book in place, and a camera or imaging sensor to capture images. Images are then automatically shuttled to a central computer repository, where automated processing may take place in order to perform cropping, de-skewing, and other image enhancement functions. During the process, the book remains intact. Several high-end commercial robotic scanners use traditional air and suction technology while others take advantage of optical sensor technology to separate and turn pages one at a time.-*Book Scanning Wikipedia*

Stanford Robo Scanner

The Stanford University Libraries & Academic Information Resources (SULAIR) operates a robotic page-turning and scanning device for the mass digitization of bound print materials, the first of its kind in the world. Called the Digitizing Line (DL), this book scanning device is the centerpiece of SULAIR's broad array of on-campus digitization capabilities. The ultimate output of the DL is a searchable e-book, in PDF Image and Text format that will be made available to the Stanford community to support teaching and research.-*SULAIR Stanford University*

Project Frame Work:

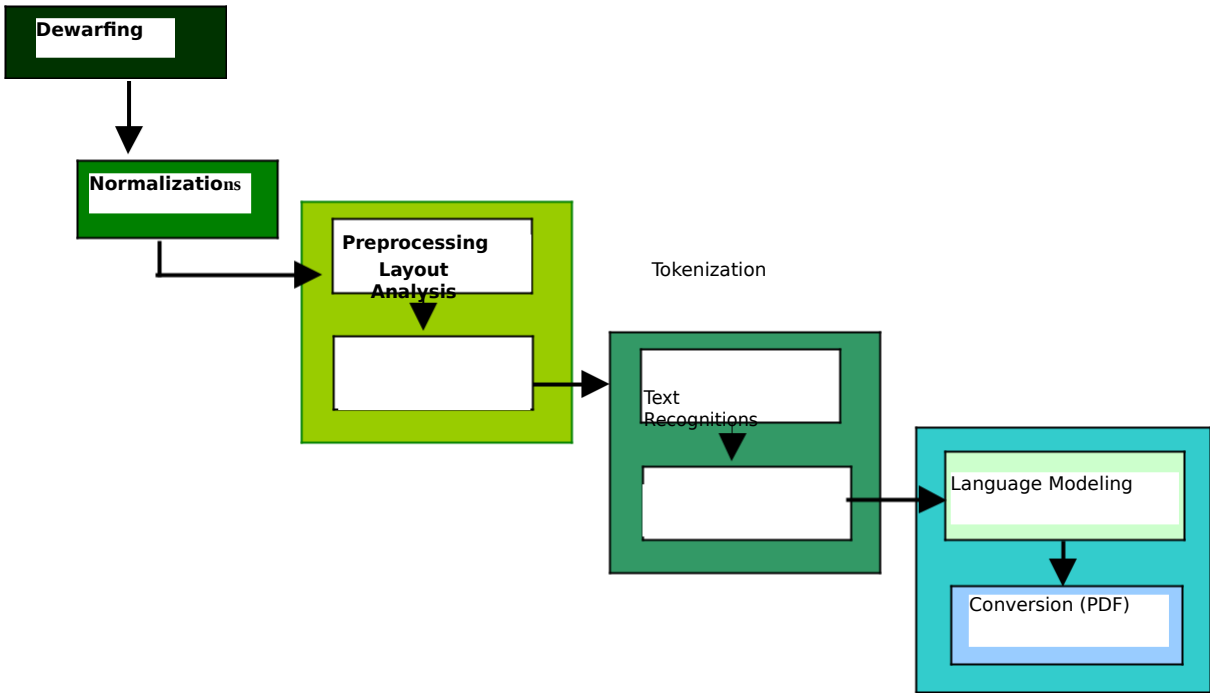

Figure 1: Conceptual Framework

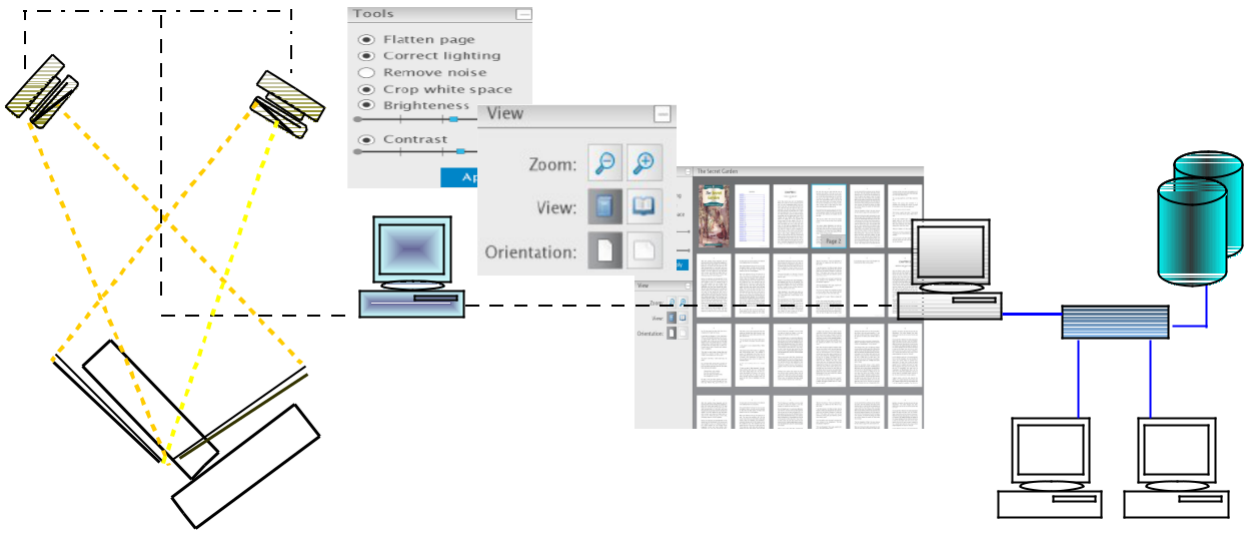

Figure 2: Actual Framework

Methodology:

Library Concept review

The initial steps of the project will cover overviews and reviews, about the history and the needs of a Digital Library. The current technology being used at present to maintain the accessibility of whatever resources of any format be it online or in Archives. The possibilities and advantages of developing such project as solutions to the requirements of modern libraries to leverage the current trend of technologies and the demand for itself.

RoBook Scanner Community Involvement

This is the community or the group involvement in realizing RoBook Scanner Project. Technical expertise will be the responsibilities by the Information Technology Officers and the Computer Services Team to have an important role in building the RoBook Scanner such as: main design & concept of hardware & software development .Quality control will be taken in charge by the staffs who pioneered archiving, micro filming and scanning in the UP Main Library. The efficiency and adaptability of the machine to the users will be scrutinized by the group of archivist to see its ergonomics. Machinist will also be contributing to the physical structuring and fixing of the machine and perhaps the tasks will be outsourced to another department of the university which had a facility of a complete mechanical laboratory, either in Mechanical Engineering Department or the College of Science metal fabricator if not to some Aluminum & Glassware shop. There is also an invitations to the evaluations of technical people who profess much in scientific R&D, one of them might be in ASTI-DOST, DOST Agencies or other Engineering Department of the University

Outsourcing components & materials

The next steps are the solicitations or procurement of materials that can be used to developed the RoBook Scanner project. One of the most prominent cameras that is available with high specs and feature are the Canon Powershot (AG10) which passed the necessary specs for high resolutions digitizing camera it is about 10-15 mega Pixel of high resolutions and a good candidate for a project digitizing camera. Modular software as a front end to GUI the project and contain a lot of features enough to build applications for the project is the used of Decapod project which is at present is undergoing a lot of production development although the release version can be enough to implement scanning digitization. Decapod is a combination of different engines: gPhoto for image

capturing, OCROpus for character recognitions, genPDF for PDF conversions and the Server hosting for those generated file.

Other tasks that can be paralleled to material outsourcing are the procurements of glass, aluminum frame, aluminum stands and the Canon Powershot camera. The next step is to assemble mechanical rigs and the base assembly that will hold the mounting of the bulb/lamps and the camera holder, the sliding support for the platen glass from in the V cradle and the flat base which is located underneath to the V holder of the book.

A prototype scanning rig, consisting of standard tripod hardware and consumer digital cameras. The rig is portable and can be operated anywhere using a laptop computer.

Preliminary Task & Development

First we need to download and install all the libraries required by the Linux operating system, in this case we will use Ubunto or Fedora, *.* image or photo files. Other softwares included are the different built in engines used by the Decapod. Modular installations, configurations and modifications necessary for the operations of program should be test individually to check if it’s working and there are no problems about the previous task. Engine's function might be activated by the Decapod one after the other unless there is the initial debugging or review that will occur during the workflow. On the computer side, at least one requirement for a client CPU (exclusive) usage that is to be connected in the local LAN .A need also for a host server which will serve as a temporary depository of the PDF’s generated compiled files .On the other hand, precise mechanical engineering assembly should also be aided by engineering software – C.A.D (Computer Aided Design). The most particular CAD to use is the “Autodesk “which is a common tools to visualize design or layout of the mechanical assembly (Rig, Frame, Handle, Base) yet for a short durations of project and the allotted amount of budget it is not wise to buy a license one .But some open source CAD are now comparable to a commercial grade software products and is available for free download. FreeCAD9 is the best choice among the rest for it offers easy to use features and will be used for the rest of the engineering drawing of the RoBook Scanner.

Once the initial task is done, the testing will proceed to the whole Decapod stereo camera capturing setup and from thence define some problems that will be encountered during the Preprocess and Post process of the operations. The Software modular design should overcome the following problems: Detection of both devices to function as a stereo

camera, the compilations and integrations of all the engines for OCR, pdf and imaging programs and lastly the network connections between the user/clients and the host server. Other physical considerations: are glare reductions techniques of the selected glass or acrylic, the proper angle frame of cameras that will point almost perpendicular to the page of books or at least 90 degrees of elevations- if the book page is set as base reference. There is also a factor of light diffusion's choice: a halogen lamp, a led lamp and the higher wattage for a luminous bulb. Structured lighting provides an additional source of 3D information, even on low-contrast page images, potentially improving de-warping accuracy and robustness further. Controlling over the light source permits improved dynamic range and the reduction of artifacts such as specular reflections on glossy paper some combinations of light source and camera permit limited forms of multispectral imaging and improved color correction .A sample shot should be made to compare each glass for glare reductions efficiency and the ability of each bulbs to diffuse lights. Another is the assembly of base for the book stand and the V-cradle handler. A handler that is easy to lift when book needs to be lifted or shifted. Applying techniques for the joint and lever for a fast and easy motion of the cradle is either by a worm gear, a spring or a hinges. In this stage, everything in outsourcing is accomplished except for the process of scanning.

Testing & considerations

These stages will answer the entire problem enumerated above for the initial testing & other considerations. In a quality scanning of files, in order to provide the most robust dewarping and page normalization a two camera, stereo vision approach will be used. The gPhoto is the engine which has a CLI interface accessed by the decapod, it is an open source program that has the ability to detect, set, and trigger both the camera

.In viewing the output image of gPhoto, the user interface or the front end GUI will be a browser- based and rely on AJAX and FLUID components (Fluid carries an ECL-2 license). The back-end services will be based on OCRopus components. The user interface and back-end services communicate using a REST-based interface (with the option of streaming video for real-time adjustments during calibration). There is now a reiteration to the procedures to review and modify the previous plan for the projects. Actually it will include Interactive correction screen. Although the workflow is intended to be automated and allow capture without human interaction, occasionally, fixing a document on-screen is simpler than rescanning. The user interface will contain tools for cropping, noise removal, and "digital rescanning". The user interface may also provide a high resolution scrolling preview of the entire captured book, to allow scanner operators and quality control operators to visually check the results of a book scan and make corrections. A non-scrolling facing page

view provides another view on the scanned output and gives operators and quality control another way of checking a book for consistent layout and scanning. In addition, this view may also be useful as an end-user book reading application for users who require access to the scanned view of the image without further processing .In the framework approach the original document, including figures, degraded fonts, and text requiring a complex language model.

After the Preprocess of scanning, there will be a mock-up of multi-pages materials scanned and editable in the sort and edit screen. The relationship between the OCRopus system and the additional modules shall be developed as part of this project. The first pipeline is the standard OCRopus processing pipeline. The second pipeline is the Decapod book scanning pipeline. Existing OCRopus components are in blue, components to be developed as part of this project are in yellow. Please see the text for a detailed explanation of theoretical framework-Figure (1&2).

The mechanical parts of the design require flexibility and mobility. Check-ing the weights of each component is important to gather light and rugged hybrid characteristic of materials. Flexible assembly stand, could handle the v-cradle freely, could fix the bulb tightly and could handle both cameras. Actuations of joints in junctions will be analyzed to design the most effective movement which is convenient to the users that is less or no noise during its locomotion –in order to have enough precisions. The stabilities in its junctions and joints are an assurance that it really fits to the working condition as frame -shield to RoBook Scanner.

Final Testing

After ensuring that variables are contributory to the problems were already been cited what shall follow is the overall testing of the project-finale. Since all the process of scanning will depend very much on the input source, it is good to have rigid reviews of what the quality the input image is. At this time, the detail reaching the sensors of the cameras is limited by the optics (technically the MTF or modulation transfer function) and so increasing the pixel count of the sensors doesn't help beyond a certain level, because the physics will guarantee a certain blurriness, and to further exacerbate it, as the resolution increases the size of each pixel decreases, making it intrinsically noisier, and less light reaches it, again increasing the noise level. Note that we have chosen 600 dpi as our project goal because it is the defacto standard for archival of bilevel (black and white) content. Although the proposed solution will readily allow higher resolutions by using more expensive cameras there is good reasons why more is not necessarily better. File size increases very rapidly

as the resolution increases. According to studies by Ray Smith (the author of the Tesseract system) while he was at HP and later at Caere, OCR quality does not increase markedly above 300 dpi, and for Latin texts not at all above 400 dpi. For Asian texts there was some residual increase in quality up to 600 dpi, but not much beyond. This reflects the fact that the texts were designed for human viewing, they do not include any detail that is not usable by the human visual system, and anything above 600dpi is imperceptible to the unaugmented human eye. Page images are around 8 mega-pixels for letter/A4, and are poorly suited for web viewing because of both download size and physical viewing size.

An approach is needed that allows high fidelity, compact representations of the page. The final outputs from our solution will be archive quality TIFFs and compact, searchable and reflowable PDFs that are visually faithful to the original material in terms of typography, layout and illustrations. This dual output will allow us to effectively display the material from a web site with compact representations that download and render quickly. RoBook scanning system will produce TIFFs with page images at up to 600 dpi resolution for letter/A4- sized bi-tonal inputs. These TIFFs can be readily injected into any standard digitization workflow, all of which have facility to have "watch directories" into which images can be deposited. The PDFs (in particular the PDF/A profile with embedded fonts) will contain a visually accurate representation of the original document content with a resolution equivalent to 600 dpi binary images (for A4/letter-sized inputs). Encoding inside the PDF will be analogous to mixed raster content (MRC) format, with token-based compression for text regions, and separate compression and representation of embedded images. The PDFs will be structured and tagged to facilitate native re-flowing and the glyph tokens will be represented as fonts to allow for searching.

Preliminary Evaluations & considerations

After the final testing, this stage shall require the involvement of archivist and librarian to ensure if the phase 1 of the project would meet expected criteria as a good tool for their book digitization. Feedbacks will be looped back to test the procedures again, and relate to the quality of images generated the convenience of the user of the said machine and to the flexibility ease of use the mechanical assembly.

The evaluation will be performed by other party with technical expertise in the projects field are related to the RoBook Scanner. PDF was chosen because of its widespread acceptance and because at this time it is the only format able to handle the custom fonts, searchability and reflow tagging. These properties give it the flexibility to be used in diverse ways,

including mobile devices and text to speech, whilst still perfectly representing the original document. That being said, if another format is needed then a new file output stage could be used that would apply the analysis results to the generation of that output format.

Final Evaluations

Overall design & system integrations will happen only and only if there are technical approvals for technical buddy to comment on the overall design of the project. The technical evaluations will focus on virtue of the synthetic font generation process, the PDF/A conversion process will result in documents that are close in quality to burn-digital documents. The requirements on the system's output are: Visual fidelity takes precedence over any other aspect of the conversion; that is, the PDF should look nearly identical to the original scanned document. Tokenization should result in significant memory savings from representing the character shapes. If the original document layout could be analyzed with high confidence, the resulting document should contain PDF tags that permit display as a reflowable single column document. Those extended workflows can apply other conversions and manipulations such as high-accuracy OCR, meta-data entry and institution specific formatting. RoBook Scanning Software will generate high quality PDFs by applying token (glyph) clustering and vectorization to create document specific embedded fonts and layout analysis to derive reflow. This will result in compact, visually faithful, searchable PDFs that can be reflowed. RoBook Scanning system's output will support original layout and typeface and yet allow the client to adapt the images as necessary, for example by reflowing or using text to speech. We have chosen PDF as the default output format in this release because it is the only widely used format that currently supports required functionality. That is, given imperfect OCR, very imperfect font and font size recognition PDF is the only current format that can give a perfect "100% accurate" representation in a widely used format; though this project study is still considering other promising OCR's technology-**djVU**.

RoBook systems' generated files are also compatible with the sort of "digital library in a box" solutions such as Scribd, Fedora, DSpace, and eprints, and with mobile solutions. Hence, future web applications such as HTML standards will provide appropriate functionality and the architecture of RoBook's scanning solution allows for support of such alternate formats.

Comparative Analysis

Over Head Scanner

Efficiency
Software cost
Hardware cost
Technical Support
License cost
Upgrade & Portability
Technical support

V Cradle Scanner

Efficiency
Software cost
Hardware cost
Technical Support
License cost
Upgrade & Portability
Technical support

Advantages over the other Scanner

Face up scanning
Auto-centering cradle
No page curvature
Versatility
OCR accuracy

Final Demonstrations

This is a demonstrations demonstration to be observed by the users, librarian, and technical panels around document digitization, if it really determined the project significance and objectives as it realizes the Project research problem. In addition, the RoBook Scanner will engage the eventual users of this system to help iterate an end-user solution to ensure it is easy-to-use and functionally fits the tasks needed to capture their materials. During the final demonstrations, the output must foresee solution against metrics, comparing the RoBook Scanner with existing projects as well as existing standards, practices, and user expectations (through user testing). Relevant metrics for a book scanning solution are: functionality &features cost of hardware and software, size of hardware, setup time for first time user and experienced user, operator throughput, success rate of real-time scanning error detection, output quality and resolution and maximum document size. To sum it all, RoBook Scanner aims to deliver the highest quality at the lowest cost (both hardware and staff-training time) for book digitization.

Documentations

User Guide
Manual
Reference
Technical Specifications
Design Documentations
Design presentations
Case studies

Expected Output:

1) Software (Scanning workflow)
Web GUI front-end interface for:
- LibTiffTools
- gPhoto2
- Libgphoto2 OCRopus
- ImageMagick
- CherryPy

Camera detections, settings, calibrations (Canon G10)
Stereo vision camera Image capturing
Image cropping, dewarping, skewing and
OCR Multiple page export to PDF and dJVU
Installer script for additional features

2) Hardware (Portable, RoBook Scanner)
Base frame & book handler (Platform)
2 brace mount camera
(Adjustable) V-shaped book cradle
V-shaped transparent platen
Glare-prevention shade
Lighting set fluorescent bulbs
(diffuser) USB hub & numeric
keypad Software Installation CD
- 1 Freeware Decapod software
- 1 Freeware RoBook modified software

Printed and electronic documentation
- User Guide
- Manual
- Reference
- Technical Specifications
- Design Documentations
- Design presentations
- Case studies

3) System Integrations (Overall
Scanner) RoBook Server
RoBook scanned materials/Book
Dbase RoBook page builder

Target Beneficiaries:

Academe:

Librarian with an Old Small Fragile Collection
Administrator at an Institution with Secure Sensitive Information Scholarly Content Service Provider Digital archiving & microfilming
Digital Interlibrary Loan

Government:

Municipal /Provincial Library Book Digitization
Entry Level clerk/operator at local Municipal Archives
Land title, birth, etc. certificate re-scanning (NSO, LTO, and Registrar) Municipal Inventory file documentations Assessor's old map scanning

Scholar/Researcher:

Independent Scholar research archive
Students/scholar digitizing textbooks
Scholar/Researcher Personal content
Low Vision Scholar/Researcher

Private Agency/Business entities:

Lab notebooks (not well formatted source material)
Large scale map scanning
Documents scanned back up
Web documentations

Budget Proposal:

Phase 1

Qty	Descriptions	Item/unit	Cost
2 units	Digital Camera(Canon G10)	25,000.00	50,000.00
2 units	Testing Rigs camera handler (CDR-King)	1,500.00	3,000.00
1 pc	Desk Computer(Server)	000.00	0,000.00
1	Mechanical Assembly	23,000.00	23,000.00
1	Glass Frame	11,000.00	11,000.00
2 pcs.	Bulb Diffuser (BR40/>100watts)Mogul Base	1,000.00	2,000.00
	Synthetic cover	6,000.00	6,000.00
	Documentations	1,000.00	1,000.00
	Transportations	2,000.00	2,000.00
		Total Cost	**98,000.00**

Gantt chart:

Phase 1 (September 1-December 31-2010)

Periodical Task	2nd week	4th week	8th week	10th week	12th week	14th week
Review : Book Digitization, Machine vision, Photography and Robotics						
Software Design : Programming ,Compiling ,Installation & setup						
Hardware Design: Mechanical Frame, base, sheet cover, lamp handler						
Hardware & Software test integrations						
Fist testing of RoBook Digitization						
Evaluations of Decapod to RoBook machine						
Final testing & evaluations						
Deliverables: Training & Documentations						

Summary:

RoBook Scanner project is a multidisciplinary task and requires a reserved technical skills and expertise. The project is as promising as the development and enhancement of digital library and had proven that the indigenousness does not compromise the trend of its technology advancement so much so in the digital scanning. Community involvement of professionals is a must; this project may evolve from determined goals and would continue innovations to meet the requirement of making a low-cost but hi-grade book scanner—RoBook Scanner

Glossary:

Ajax
CAD
Capture
CherryPy
Decapod
Digitize
DPI
freeCAD
Glare reductions
genPDF
gPhoto
gPhoto2
Host server
ImageMagick
Libgphoto2 OCRopus
LibTiffTools
OCR
Mercurial
Perl
Python
Pixel
Post Process
Preprocess
Reflow
Repository
REST
Scantailor
SVN

RoBook Acknowledgment:

To Him – *The First Caused*

To My Family -*The bearer of my Name*