3. TECHNOLOGY REVIEW
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3.1 SOFTWARE FOR SATELLITE IMAGE PROCESSING

It really has only been in the past few years that desktop PCs and Macintosh computers have become powerful enough to make working with satellite imaging a reality. A variety of software is available for these computers for processing satellite imagery.

There are many commercial / free imaging processing software available in the world, to mention the below are a few popular products.

ERDAS IMAGINE

Leica Geosystems' products for remote sensing include some of the most comprehensive and flexible software tools in the industry, including the award-winning ERDAS IMAGINE, as well as image processing tools built for the ArcGIS platform. Imagery is far more than pictures of the earth's surface. It is a valuable source of data that captures actual events at specific times and places in the world so that one can study how the earth changes over time. ERDAS IMAGINE gives us the tools to manipulate and understand this data.

ERDAS IMAGINE is a broad collection of software tools designed specifically to process imagery. It allows one to extract data from images like a seasoned professional, regardless of one's experience or education.

Easy to use with its large and easy-to-use selection of image processing tools, ERDAS IMAGINE both simplifies and streamlines
your workflow. It also allows one to keep in-house many of the functions one may have needed to outsource before.

At the mid-level tier of the ERDAS IMAGINE® suite, IMAGINE Advantage builds upon the capabilities of IMAGINE Essentials to offer more advanced and precise mapping and image processing capabilities.

**Features:**
- Ortho correction
- Surface interpolation
- Mosaicking
- Image processing
- Spatial analysis
- Knowledge Classifier
- Spatial Modeling Language (SML)

**ER MAPPER**
Earth Resource Mapping (ER Mapper) is proud to be the leading desktop image processing software developer. The ER Mapper product family provides imaging solution for any application:

- Prepare imagery for use in any application with **ER Mapper**. The latest release of the No.1 image processing software package features ortho rectification, automatic Mosaicking and color balancing, ECW compression and much more.

- Use imagery free in any application with **Enhanced Compressed Wavelet** (ECW) compression technology. This fundamental breakthrough in image compression allows alls
desktop imaging applications, such as ArcView®, MapInfo®, AutoCAD Map® and Microsoft® Office, to incorporate large imagery.

- Serve imagery to any application – via the Web with the latest addition to our product family, the **Image Web Server**. Based on the patent-pending ECW technology, the Image Web Server allows users to view and work with imagery over the Internet or an intranet.

Since 1989, superior products coupled with a responsiveness to customers that is unmatched in the industry have supported ER Mapper’s steady growth, which includes the expansion of its reseller network to 300 companies. Founded by Stuart Nixon, the company is committed to making image processing easier so that professionals at all skill levels and disciplines can effectively utilize the power of Geoprocessing and remote sensing technologies. Earth Resource Mapping is totally committed to open software standards for imagery.

ER Mapper is used by professionals in a wide range of industries, including air photo data, state and local government, environmental science, telecommunications, defense, agriculture, forestry, oil and gas, and mining. Anyone who manages the earth’s natural resources or the urban infrastructure has an application.

When compared to other image processing products on the market, ER Mapper provides several unique benefits:

- The graphical user interface is genuinely easy to use, reducing training time at all levels and increasing productivity.
• Real-time processing increases processing speed by 10 to 20 times for faster interactive visualization of geographic data.

• A truly open, user extendable system that can be connected to other products and tailored to any image processing need.

ECW was a natural progression in the ER Mapper product family as users worldwide were creating large imagery using air photos, satellite photos and other image data formats. Finding a way to use this imagery easily and without sacrificing image quality became crucial. ECW can compress terabytes of imagery to mere gigabytes, and it does so faster than any other product, maintaining a level of quality almost identical to the original image.

**ENVI**

ENVI is the ideal software for the visualization, analysis, and presentation of all types of digital imagery. ENVI's complete image-processing package includes advanced yet easy-to-use spectral tools, geometric correction, terrain analysis, radar analysis, raster and vector GIS capabilities, extensive support for images from a wide variety of sources, and much more.

ENVI is the premier COTS software solution for defense and security operations

ENVI provides the most reliable image processing for forestry & agriculture.

ENVI is an all-in-one package providing easy-to-use, yet sophisticated tools for managing forests and habitat using remotely sensed images. Whether one is working in dry climates using optical data, or cloud covered tropical regions using radar imagery, ENVI provides the tools to extract the vegetation and terrain information...
one need. ENVI is also the undisputed leader in hyper spectral image analysis, providing the only environment capable of fully utilizing the feature identification power of hyper spectral data. Easily ingest panchromatic, multispectral, hyper spectral, radar, elevation images, or vector GIS data.

- Detect disease or pest infestation before damage is visible
- Map specific tree species using advanced spectral analysis
- Identify terrain features and go beyond slope and aspect to literally 'classify' elevation data
- Integrate image analysis functions with raster and vector GIS functions: line-of-sight analysis, buffer zones, vector digitizing, editing, and querying
- Interact with ones images and vectors in 3D

**IDRISI**

IDRISI Kilimanjaro is a sophisticated GIS and Image Processing software solution that includes over 200 modules for the analysis and display of digital spatial information. No other software package for spatial analysis offers such a range of capabilities in an integrated format and at an attainable price.

Our users manage complex environmental issues, and their needs are constantly changing. In order to provide effective and responsive environmental management solutions, Clark Labs is committed to IDRISI is one of the most widely distributed raster GIS and Image Processing systems in the world. Primary reasons for this include the ease of use of its Macro Modeler, its state-of-the-art tools for Decision Support, Uncertainty Management and Image
Processing, its unified nature (no add-ons), and its open architecture and extensibility (through its accessible Application Programming Interface). In addition to the software, the system includes extensive on-line documentation including a 300-page tutorial complete with 300 MB of data.

**PCI Geomatics**

PCI Geomatics is a world leading developer of Geomatics software (geographic modeling, measurement, analysis, and output) and solutions based on its remote sensing, digital photogrammetry, spatial analysis, and cartographic editing programs. The company is a privately held Canadian Corporation headquartered in the Toronto area with another large facility in the National Capital Region. Its software products and solutions are distributed through a direct sales force, international resellers, and third party developers. A powerful ortho-rectification tool - with Generic Model, use new or unsupported satellites. Generate precise orthoimages while correcting for distortions with the RPC Model. Add-on to Air photos, Satellite, High-Resolution & Generic & RPC Models. This module allows automatic extraction of DEMs from stereo air photos & selected satellite sensors.

Little other popular Image process software to mention is

- ILWISS
- TNT MIPS
- SPANS
- Arc View Image Analyst
- GeoMedia Rater Analyst
- Multispectral
3.2 Visual C++

Visual Programming

Visual programming aims at providing the user with an interface that is intuitive and easy to use. In developing such as interfaces, the programmer employs user-friendly features such as windows, menus buttons and list boxes.

User Interface: This is the screen displayed by the application. We interact with an application via the interface. Every application has a user interface in one form or the other. The application asks for and we provide the necessary instructions using the interface.

Program: -Computers needs clear cut instructions to tell them what to do, how to do, and when to do. A set of instructions to coronet a specified task is called a program. This is what goes on in the background.

The need for visual programming:
There are several programming tools that allow us to build such visually appealing and intuitive interfaces. These tools allow us to design interfaces that employ user-friendly features such as menus button, windows etc.

Rapid application development (RAD) tools
Rapid application development tools help us to create applications in a shorter time as compared to conventional languages with fewer errors. A RAD tool helps us to create a range of applications. Visual C++ is Microsoft RAD tool for windows programmers. Visual C++
uses a graphical forms-based approach to application development. The typical way to write a program in visual basis is to create a form, drag and drop controls onto the form, set properties for the form and lists controls, and adds application-specific code to handle events. It sounds simple, but we can write some very powerful applications in this manner.

**Advantages of visual programming:**
- Visual development of graphical user interfaces which are easy to use and easy to learn
- A Programmer need not write code to display the required component
- The visual programming environment displays a list of available components. The programmer picks up the required component from this list to display it.
- The component can be moved, resized and even deleted, if so required
- There is no restriction on the user interface visually he can align move or size the components as required without having to resort to writing code.
- The interface components provided by the visual Programming environment have some code bold into them

**Some Popular Visual Programming tools are:**
- VISUAL BASIC
- VISUAL C++
- VISUAL FOXPRO etc
Some Visual Interface Components

1. Windows
A window sometimes also called from is the important of all the visual interface components.
The Window is the base for user interface of the application. All the components that make up the user interface are placed in the window. When the application starts, it opens a window once the window is loaded into the memory, all the components contained in it come into existence and can be accessed.

2. Buttons:
Generally there are three types of Buttons

**Command Buttons:** The plain buttons that we simply click and release are the most common type of buttons. These are the buttons we see everywhere in VC++ applications. They are usually just rounded, rectangular, gray buttons with a caption.

**Check Boxes:** These are familiar controls, one click a checkbox to select it and click it again to deselect it. When one select a checkbox, a checkmark appears in it, indicating that the box is indeed selected.

**Option Buttons:** These are also called radio Buttons. Are checkboxes in that we select and deselect them.

3. Text Boxes:
Text Boxes are used to accept information from the user. The user interface will display one text Box for each piece of information.
4. **Menu Bars:**
These are those clever controls that hide away lists of items until we want to make a selection like the Visual C++.

5. **Tool Bars:**
These Bars are at the top of a window. That is filled with buttons and sometimes-other controls like combo boxes

6. **Status Bars:**
These Bars are used to see the current status.

7. **Picture Boxes**
Picture Boxes are more complete controls than image controls. Just as the rich text control provides a sort of word processor in a control, so the picture box does for graphics in VC++. We can load images into a picture Box, save images to disk, draw with some rudimentary graphics methods, print images, work pixel-by pixel set an image's scale, and more. Besides

**Default Functionality of Interface Components**
The ready to use interface components supplied by a Visual Development Environment in Corporate certain behavior. The Default behavior can be altered to meet the requirements of the application.

- **Properties:**
Associated with every component are certain characteristics. These characteristics are used to describe the component. The
Characteristics of the component are referred to as the properties. They are set to default values when the component is created.

- **EVENTS**
  A Major part of the interactions between people in everyday life is in the form of events and response to events. An event is any user action directed at the application. The interface components have the ability to respond to events the event driven application operates by responding to the user events

- **Methods**
  A method is code that is built into the interface and can be executed as required. Add them is referred to as the Method. Similarly most controls provide a method called move that can be used to reposition the control during the course of the execution. Each component has several methods associated with it. Each method provides a distinct functionality. Unlike properties some of the methods require additional information in the form of arguments

Pictures showing a few designs or front-end screens, which are developed in the current research work, are enclosed here.