- Pilling up of hardcopies of the theses in the library can be avoided
- Obviates usage of paper and maintenance
- Minimize shelf space and maintenance
- Drastic reduction in cost
- Easy desktop access utilizing modern IT tools

- Saves time of the researcher that is required for visiting library and for browsing through the theses & project reports to reach required information
- Helps researcher to identify groups working in similar areas and speeds up collaborative work
- Deterioration & damage of papers (brittle & yellowish) in print copies of old theses are preserved in their digital form

For storage and dissemination of the ETDs, following hardware and software were selected. Overhead scanner model 'Minolta PS7000, Book Pro 7000'was used and it came with allied software 'ABBY Fine Reader Professional Edition 9.0' for retrieving & cleaning scanned images. For storage and dissemination of the ETDs, existing server based software dSpace Version 1.7.2 was utilized. dSpace is a freeware and upgraded regularly. We have installed and customized dSpace on Linux platform for storage and access of the ETD's, to meets our requirements. The ETD collection was grouped under the main subject categories related to our area of research such as Physical Sciences, Engineering Sciences, Mathematical Sciences Chemical Sciences, Life Sciences, Health Sciences, and Strategic Sciences.

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I.5: Developments in electronic security and support systems:

A) Commissioning of Electrical Fence Intrusion Detection System:

Electrical fence of 4Km. length, has been installed around the lab area of RRCAT, to prevent unauthorized intrusion inside the premises. One segment of electrical fence comprises of an energizer, wires, corner posts, line posts, insulators for zone separation and a central monitoring unit. An energizer is responsible to generate 5 to 7 kV pulses with pulse separation of 1 second and pulse energy between 1.5 and 5 Joule. These pulses provide a non lethal repulse shock to an intruder. One energizer can energize two zones of about

300 meter length each. Eight such energizers in sixteen zones have been commissioned to cover the entire perimeter. The zoning scheme makes it possible to easily locate the point of intrusion on such a large periphery. Wires carry high voltage pulses along the zone and back to the energizer for the detection of pulses. Corner posts and line posts provide mechanical support to the wires.

The central monitoring system is located in guard house, which is observed on round the clock basis by the security staff. It is connected to all the eight energizers, using RS485 communication network, and connected in daisy chain manner. The warning and error messages are sent to the central monitoring unit by the energizer. These errors and warnings are logged and displayed on the screen with date and time stamp. Recently, the old LCD (Liquid Crystal Display) based system was replaced with an indigenously developed PC (Personal Computer) based central monitoring system. This system displays the warnings graphically. Warnings are superimposed on the aerial view of the RRCAT lab campus image. Because of graphical representation, it is easier for the security personnel to locate the exact location of intrusion attempts. It also generates audio alarms in case of intrusions. The system is equipped with a redundant wireless communication network system for transmitting warnings to the central unit. Currently, the entire electrical fence is fully functional and operational round the clock. Figure I.5.1 depicts a portion of the electrical fence with an energizer and figure I.5.2 depicts sample warning as observed on central unit in case of intrusions.

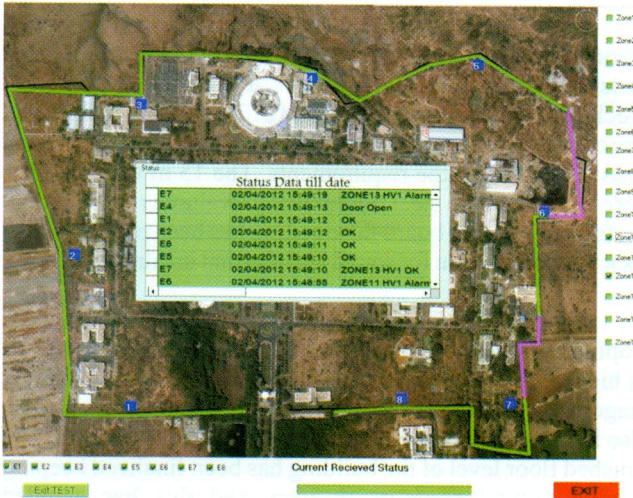*Figure I.5.1: A portion of electrical fence with an energizer*

Figure I.5.2: Sample graphical warning displayed in the central unit

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B) Development and Deployment of a system for generation of new Identity Cards for RRCAT employees:

Validity of identity cards of RRCAT employees expired on 31/12/2012. New identity cards have been issued with fresh validity up to 31/12/2017. Four processes were involved in this namely, data collection, capturing photographs and digitizing signatures of card holders, card printing and writing data in to the card memory. A new centralized database was created and details of card holders were added to this database. To verify ID card details of individual card holders, a web based ID Card Management Software (IDCMS) is developed, through which each individual can login to see his ID card details and can give feedback, in case of correction or approve it for printing. This application has requisite interfaces to edit all details of card holders and adding new details.

Software module has been developed in Java language, for creation of ID cards, which helps in faster printing and minimizing errors in creation of cards. Figure I.5.3, shows graphical user interface of this software. For generation of ID cards, the software uses centralized database for the details to be printed and creates a PDF (Portable Document Format) file of ID cards in DAE approved format. There are three options to create ID cards, namely division wise, for a range of employee nos. and for a single employee. Options are provided for changing issuing authority, validity of cards for employees on extension and generating cards for retired employees. Once a PDF file is generated, it is sent for printing, hologram fixing and lamination.
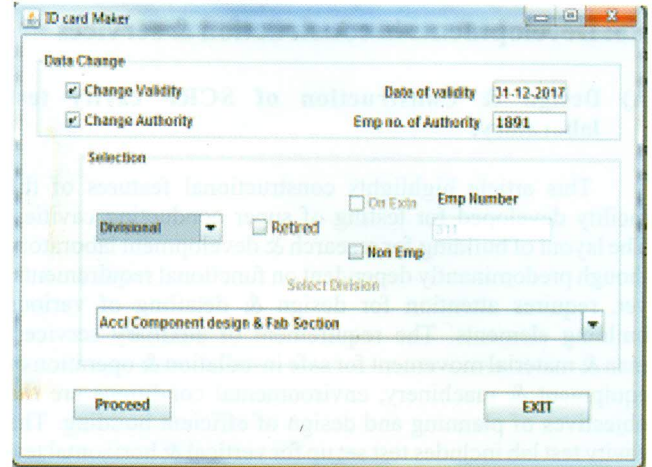

Figure I.5.3: Graphical user interface of the ID card creation software module

Software module has also been developed for personalization(writing data in to card memory) of printed cards in Visual Basic. Figure I.5.4, shows graphical user interface of the software. This software uses RFID (Radio Frequency Identification) based smart card programmer for personalizing RFID cards. The details of individual employees are accessed from centralized database. This software keeps track of UIDs (Unique Identification number) of all the cards that are being personalized. If a new card is issued to an employee on the basis of promotion, lost card or damaged card, the old card UID is uploaded to blocked card list. This list can be uploaded to all the ID card readers for avoiding misuse of these cards. UID of last five cards, issued using this software, is maintained in the database for each employee.
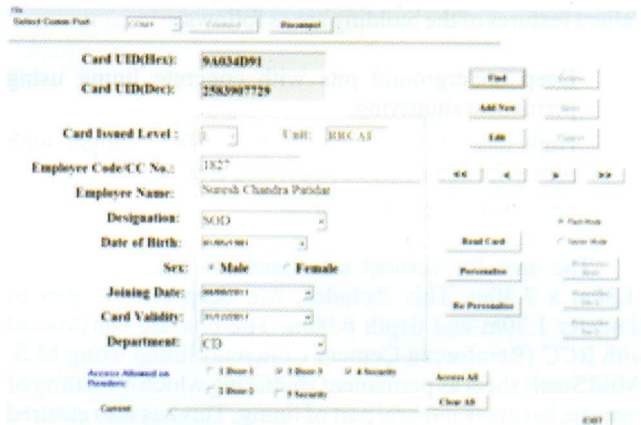

Figure I.5.4: Graphical user interface of the ID card personalization software module

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