**Technical details/ challenges**

Thanks amit,

So by now I **hope** you got a **good** overview idea of the benefit and applications of the project. Also you have a **fairly good idea** of how **users interact with the system**.

However till now, we have **intentionally kept all technical details** of working of system inside a **blackbox** while explaining only the interface. Now I will **try to unravel this blackbox** and explain some of the **essential details** .. yadayada

**Smith charts simulations**

* TRF7960 has a small antennae whose range is **only a few cms**…
* However according to our requirement we require an antennae whose range is of the O(1m)
* Our objective is to increase the range of the antanae.

These are some simulations that we performed to get **tuning parameters and range of antennae.**

**Results**

Here you can see the results of these simulations.

**Hardware circuits**

So when we realised these results in practise, we found that the software is quite accurate. We have been able to increase the range to around quarter of a meter with this antennae.

We also tried to use power amplifier, however there was some distortion.

**Software - Mathematical model**

Ok so that was all about hardware, now coming to software part.

* This is probably the most technical slide of the presentation but this stuff is very simple for the person who knows this jargon.
* Basically I have tried to model the position parameter of the book which is the main fundamental difference bw present generation and our smart library.
* However for people who are not so mathy, I’ll just try to summarize in very simple language and we will arrive at very fundamental result.

Expain all the sets

* yadyada

**Flowchart**

This is the an overview of how the software **runs underneath**.

* Conventional RFIDs are designed to just report the tags that it **sees or senses**.
* It wont report **delta**.
* So if a user comes and pick a book it wont tell me that one tag is missing.
* So we calculate delta, we’ll just maintain a history.
* We have tags in t-1 and t..
* Using this, this is how the program goes….

So **here goes the flowchart**. SO ON AND SO FORTH

Ofcourse there is much more detail in the program, regarding to its interaction with hardware etc, synchronisation, etc which is all very technical and regular stuff, so I won’t discuss all that due to time constraints.

**Data structures**

**Diagrams**

* This is the system we had planned to build.
* It was a much bigger system with all the functionality of a LMS.
* However due to time constraints what we have shown you is just a quick and dirty implementation of this much bigger idea
* Because this is all regular stuff, so I wont go in details..

So as you can see there is variety of classes in this class diagram. However in the demonstration we have just tried to depict the idea, so that is just a subset of this much bigger system.

**Conclusion**

Ya, so time to wind up

**Possible refinements**

Ya, so we have some refinements to this system.

You have just seen in the demonstration that user can place the book anywhere according to his own will, while returning the book. Still he won’t compromise the next person finding that book.

However there is a big catch here. If this continues to happen freely soon books will be so random that categories will lose their meaning. In such a scenario a patron goes to physics section and he finds all books of economics.

And this could be a big mess.

Explain..

**Feasibility**

Ya, feasibility. So this is very important part of our project. A **probable critic may argue** that there’s a big investment required to implement this is library

n ya that’s true that this does require a good amount of investment at start. However there is a very interesting to point to note here that, once the system starts working there’s almost no manpower required which will drastically cut down expenses.

Pay off period

Moreover, all this with a drastically improved user experience n believe our society is always ready to spend money for user experience. That’s why user experience is becoming a big deal today, IT people will know here well..

**Comparison**

**Video**

**Thanks**

**References**

**<http://en.wikipedia.org/wiki/Associative_array>**

**Dictionary Data Structure**

A dictionary data structure is one which is capable of storing objects in sorted order based on key such as a string or an integer. For instance, say you have several hundred Base objects which consist of the name of the Base, the latitude and longitude at which it is located, and its armaments. One way of storing these cities is to sort them by name; another is to store them in decreasing order by armaments; yet another is in increasing order by latitude. Primarily, the dictionary component will store objects based on some sort of a string key, such as the name of a Base or Target. The main purpose of the dictionary is to provide us with an easy way to see what data points we have already entered into our SoftWar database. The term *data* *dictionary* will be used in class to refer to this component, or to a collection of components having this role.

1. **List out the all the advantages of your invention.**

As mentioned clearly in the report in a chart format (please refer to that as well), our invention moves ahead of other existing systems and addresses these problems.

1. In our system the user will be able to issue and de-issue book on the fly without intervention of any library staff. The interaction of user with the system is so simple and elegant that the person will never have to worry about anything. The patron will be able to issue book within seconds with our system. This will improve the user experience significantly.
2. Misplaced books are never lost in our system. Even if a careless user picks a book and keeps it on another shelve (intentionally or unintentionally), the RFID sensor on the shelve will detect the book’s unique ID and update the new location in the central database. So when a new user comes to find the same book, the searching interface will show the new location of the book. So he can find the book within seconds.
3. Apart from the two main advantages some secondary issue are automatically addressed in our system. Notice that in our system the book always remains in any of the two states ISSUED\_WITH\_USER\_X or WITH\_SYSTEM\_AT\_LOC\_X so the system always know where the book is. This is in contrast to previous system (existing RFID or barcode) where the book can be of three states WITH\_SYSTEM\_AT\_UNKNOWN\_LOC WITH\_SOME\_UNKNOWN\_USER ISSUED\_WITH\_USER\_X. The former will always know with which user the book is (if it’s not with the system) while the latter does not know who has taken the book while in library. Moreover the latter system has only partial information about the book. There is a period in between where the system has no idea with whom the book is. This is a clear loophole in regard to security. So this period is used by defaulters for exploiting the system. In our system clearly better surveillance is possible using other technology like CCTV cameras and tempering theft of book can be better addressed.
4. **If there is any further information respecting to the development in the present invention, please share it with us.**

We have also planned to include some identifying information (apart from unique ID of RDIF) of each book in the RFID passive memory tag of each book. This information may contain an encrypted signature of the university which will indicate without doubt that the book belongs to the university. The password will be held only by university people so any other party can’t claim the book. We are still brainstorming what additional information could be included in the memory in the RFID tag, which can improve the system.

Another point is that we want to generalize the placement of antennae’s. It should be noted that, antennas can be placed in a couple of other ways as well for the achievement of the same purpose. We will provide you the required cad diagrams shortly.

We are also planning to include another sensor at the gate which can detect the book before the person leaves the library. This can be possibly included to enhance security. The sensor, at the gate double checks who’s talking which book. This security can be increased to three fold security as well.

Apart from that we will like to address another problem that may occur in our system. When users will have freedom to place books anywhere around library can turn messy very soon, in which sections will soon lose its meaning. All the books will be mixed around. This can be a bit of problem for a user who wants to see all books section wise and search for the books based on appearance. This issue can be addressed as follows.

* *When the user will place the book back on the shelve, the RFID sensor can detect whether the books belongs to that section or not.*
* So the user can be prompted back that he hasn’t placed the book at the right location.
* We can implement the policy as per the choice of students that what will happen if a user places the books at the wrong location.
* *We can implement a credit based system where a user placing all books at the right locations will get more credit points and issue more books at a time while a careless user who don’t cares to place the books at the right location may get –ve credit points and so his issue limit can be reduced.*
* *More such social policies/ economic (fines etc) can be adopted to make the library a better place for all.*

1. **How the main database is maintained and to which other systems it is connected? Explain how the main database is interlinked to other system components of the “smart library system”?**

The main parts of the software, in relation to function performed are

1. RFID software (in computer) that will communicate with the software on the RFID hardware(there will be multiple of them connected via USB) and ensure all signals that are coming from various RFID hardware(different antennae) are served with minimum latency. This can be regarded as a *driver (level0)* software. These low level signals are then used to generate high level signals (software interrupts) that will be user by the software above this. So this is in a layered architecture.
2. The software above the driver, *level1* will communicate with various other systems to perform various functions.
3. There will be *review software* that upon receiving signal from the high level (layer 1) RFID software will fetch reviews from the database and display them on the LCD screen above the shelves.
4. Similarly there will be other systems which we have mentioned in the report (administrator’s computer, searching interface). Important point to note here is that all these systems (separate but dependent software) including the database (sql) can be implemented in separate physical machines interconnected through a network. So without any loss of generality of the idea, in demonstration we have implemented a sql database in the RFID computer for the sake of simplicity, this can be implemented on an entirely separate machine.