Digital Alba Iulia. The System Integrate for Regional E-government SIRE-go

Mircea Risteiu, Ioan Ileana, Mihai Pascaru

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Integrating Information Technology and Social Science Research for Effective Government

Authors: assoc. prof. Mircea Risteiu,
prof. Ioan Ileana,
assoc.prof. Mihail Pascariu
University of Alba Iulia

Abstract
The Digital Government Society (DGS), or Intelligent Society is a global multi-disciplinary state particular "to society" contributors and practitioners engaged in and committed to democratic digital government. Digital (or electronic) government fosters the use of information and technology to support and improve public policies and government operations, engage citizens, and provide comprehensive and timely government services. DGS equips its members with a professional support network focused on both education and effective practices that nurture technical, social, and organizational transformation in the public sector. The DGS welcomes members from all sectors, endorses diverse, multi-, and interdisciplinary research undertakings relevant to both theory and practice, and strongly encourages practitioner-researcher exchanges at local, regional, national, and international levels. The purpose of this project is to delimit the *Digital Entities*, as "images of reality", made of *Data*, (the bits - zeros and ones- put on a storage system, *Information* (the attributes used to assign semantic meaning to the data), until *Knowledge* (the structural relationships described by a data model or semantic relationships between attributes). Every digital entity requires information and knowledge to correctly interpret and display

Keywords: regional development, information technology, social science, e-government, GIS, digital entities

I. INTRODUCTION

1.1 Local/regional government *vs* communication technology

As literature explains, e-Government explains that the government's best practice use of information and communication technology (ICT) in order to exchange information and services with citizens, businesses, and other arms of government. e-Government includes legislature, judiciary, or administration, culture and recreation, education and promotion in order to improve internal efficiency, the delivery of public services, or processes of democratic governance. The primary delivery models are Government-to-Citizen or Government-to-Customer (G2C), Government-to-Business (G2B) and Government-to-Government (G2G). The important benefits of e-government include improved efficiency, convenience, and better accessibility of public services. [2] has proposed a structure of the three modules. Each one has a data distribution as is shaped in the figure 1.

1.2 Available information technology

While e-government is often thought of as "online government" or "Internet-based government"—many non-Internet based "electronic government" technologies can be used in this context, including telephone, fax, PDA, SMS text messaging, MMS, and 3G, GPRS, WiFi, WiMAX and Bluetooth. Other technologies can include CCTV, tracking systems, RFID, biometric identification, road traffic management and regulatory enforcement, identity cards, smart cards and other NFC applications; polling station technology (where non-online e-voting is being considered), TV and radio-based delivery of government services, email, online community facilities, newsgroups and electronic mailing lists, online chat, and instant messaging technologies. There are also some technology-specific sub-categories of e-government, such as m-government (mobile government), u-government (ubiquitous government), and g-government (GIS/GPS applications for e-government). There are many considerations and potential implications of implementing and designing e-government, including disintermediation of the government and its citizens, impacts on economic, social, and political factors, and disturbances to the status quo in these areas. In countries such as the United Kingdom, there is interest in using electronic government to re-engage citizens with the political process. In particular, this has taken the form of experiments with electronic voting, aiming to increase voter turnout by making voting easy. The UK Electoral Commission has undertaken several pilots, though concern has been expressed about the potential for fraud with some electronic voting methods[1].

1.3 Data quality ensuring

Data quality can be assessed through data accuracy (or error), precision, uncertainty, compatibility, consistency, completeness, accessibility, and

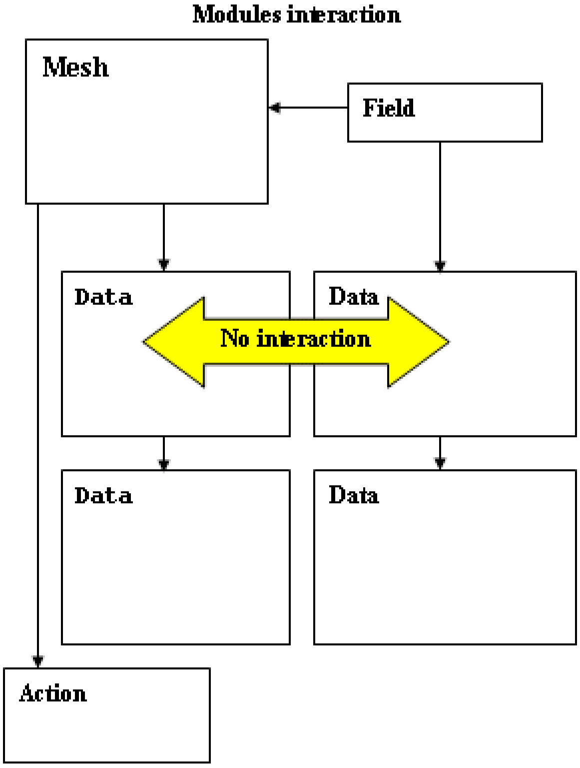

Figure 1 Implemented structures

timeliness as recorded in the lineage data. Spatial error refers to the difference between the true value and the recorded value of non-spatial and non-temporal data in a database. Attribute error is more complicated than other types of spatial errors. It is related to scale of measurements. The upper figure is extremely consistent from this point of view.

On the other hand, at one scale of measurement, the difference may be regarded as error while not at another scale. For example, an elevation of 497 m recorded in the database with its true value being 492 m will be considered erroneous at the ratio and interval scales but accurate in a general category such as an elevation class between 450 and 500 m which is at the nominal scale. However, sometimes the true value is not known, error can not be evaluated. Under such circumstances, uncertainty is used. Statistically, we use the average from multiple measurements to estimate the true value and the standard deviation of the multiple values as an indicator of the level of uncertainty.

1.4 Avoiding inaccurate information

In order to avoid situations like we particularly mentioned a method which is used in remote sensing image classification, where a relatively complete procedure exists for classification error analysis could be used here. Related to this, we

approach the classification error analysis into 5 steps:

- determine the sampling method for ground truth data collection; Methods include systematic sampling, random sampling, stratified sampling and systematic unaligned sampling, etc.
- determine the sample size;
- determine the attribute of sample location; this is usually done by field survey or the use of more accurate data sources such as aerial photo interpretation;
- compare sample data with classification data and establish the contingency matrix;
- calculate various types of errors from the contingency matrix.

This can be applied to the determination of any type of attribute error at the nominal measurement scale, and based on this, we are building a new data processing structure for the designed GIS.

II. BUILDING A DIGITAL GOVERNMENT SOCIETY

The development of specialized software for spatial data analysis has seen rapid growth since the lack of such tools. The main objective of the software is to provide the user with a natural path through an empirical spatial data analysis exercise, starting with simple mapping and geovisualization, moving on to exploration, spatial autocorrelation analysis, and ending up with spatial regression. Let's start with a basic data processing example. By using a single database variable, as elevation positioning, we have detected a logical inconsistency. The standard error difference between area mean and population mean caused bias in estimating population mean.

The first issue of this project is to delimit the Digital Entities, as "images of reality", made of Data, (the bits - zeros and ones- put on a storage system, Information (the attributes used to assign semantic meaning to the data), until knowledge (the structural relationships described by a data model or semantic relationships between attributes). Every digital entity requires information and knowledge to correctly interpret and display.

The second issue is to build an HCI – based application with common facilities:

- *compatibility file format* with neutral developing environment, with open compatibilities with actual applications: ESRI, AutoDesk, Word, Excel, PDF, PS, PRT;
- *open property database* for with maintaining data property ;
- *multiple file management*, where the integrated management of the files and applications has to be used for access facilities
- *fast data sharing*, is demanded for a fast access to data and complex sharing

II.1 Scalability in www

All we know about the importance of having Web servers that scale well, but what exactly scalability is difficult to define. Simply, scalability is a Web server's ability to maintain a site's availability, reliability, and performance as the amount of simultaneous Web traffic, or load, hitting the Web server increases. The major issues that affect Web site scalability include: "Performance" and "Load management". Web application architects and developers must design and code an application with performance in mind. Once the application is built, various administrators/users can tune performance by setting specific flags and options on the database, the operating system, and often the application itself to achieve peak performance. Following the construction and tuning efforts, quality assurance testers should test and measure an application's performance prior to deployment to establish acceptable quality benchmarks. If all of these efforts are performed well, consequently you are able to better diagnose whether the Web site is operating within established operating parameters when reviewing the statistics generated by Web server monitoring and logging programs. Depending on the size and complexity of the Web application, the user may be able to handle anywhere from 10 to thousands of concurrent users. The number of concurrent connections to your Web server(s) will ultimately have a direct impact on your site's performance. Therefore, designer performance objectives must include two dimensions:

- the speed of a single user's transaction;
- the amount of performance degradation related to the increasing number of concurrent users on your Web servers.

On the other hand, load management refers to the method by which simultaneous user requests are distributed and balanced among multiple servers (Web, ColdFusion, DBMS, file, and search servers). Effectively balancing load across your servers ensures that they do not become overloaded and eventually unavailable. There are several different methods that you can use to achieve load management: hardware-based solutions; software-based solutions, including round-robin Internet DNS or third-party clustering packages; Hardware and software combinations; each option has its own distinct merits.

II.2 The context for GIS

In many respects, GeoDa is a reinvention of the original SpaceStat package (Anselin 1992), which by now has become quite dated, with only a

rudimentary user interface, an antiquated architecture and performance constraints for medium and large data sets. The software was redesigned and rewritten from scratch, around the central concept of dynamically linked graphics. This means that different “views” of the data are represented as graphs, maps or tables with selected observations in one highlighted in all. In that respect, GeoDa is similar to a number of other modern spatial data analysis software tools, although it is quite distinct in its combination of user friendliness with an extensive range of incorporated methods. A few illustrative comparisons will help clarify its position in the current spatial analysis software landscape.

The use of dynamic linking and brushing as a central organizing technique for data visualization has a strong tradition in exploratory data analysis (EDA), going back to the notion of linked scatterplot brushing (Stuetzle 1987), and various methods for dynamic graphics outlined in Cleveland and McGill (1988). In geographical analysis, the concept of “geographic brushing” was introduced by Monmonier (1989) and made operational in the Spider/Regard toolboxes of Haslett, Unwin and associates (Haslett et al. 1990, Unwin 1994). Several modern toolkits for exploratory spatial data analysis (ESDA) also incorporate dynamic linking, and, to a lesser extent, brushing. Some of these rely on interaction with a GIS for the map component, such as the linked frameworks combining XGobi or XploRe with ArcView (Cook et al. 1996, 1997, Symanzik et al. 2000), the SAGE toolbox, which uses ArcInfo (Wise et al. 2001), and the DynESDA extension for ArcView (Anselin 2000), GeoDa’s immediate predecessor. Linking in these implementations is constrained by the architecture of the GIS, which limits the linking process to a single map (in GeoDa, there is no limit on the number of linked maps). In this respect, GeoDa is similar to other freestanding modern implementations of ESDA, such as the cartographic data visualizer, or cdv (Dykes 1997), GeoVISTA Studio (Takatsuka and Gahegan 2002) and STARS (Rey and Janikas 2004). These all include functionality for dynamic linking, and to a lesser extent, brushing. They are built in open source programming environments, such as Tkl/Tk (cdv), Java (GeoVISTA Studio) or Python (STARS) and thus easily extensible and customizable. In contrast, GeoDa is (still) a closed box, but of these packages it provides the most extensive and flexible form of dynamic linking and brushing for both graphs and maps. For all this platforms the main subject is focused on common spatial autocorrelation and statistics. With the original implementation for all users, the data is assumed to be local, on a heterogeneous network, or obtainable via an external program. With the inclusion of DEI’s capabilities into applications, it is possible to access data via gateways located virtually anywhere on the Internet. The data can be accessed piecewise allowing large datasets to be supported.

II.3 The issue today’s developers

The design of present projects consists of an interactive environment that combines maps with statistical graphs, using the technology of dynamically linked windows. It is geared to the analysis of discrete geospatial data, i.e., objects characterized by their location in space either as points (point coordinates) or polygons (polygon boundary coordinates). The current version adheres to ESRI’s shape file as the standard for storing spatial information. It contains functionality to read and write such files, as well as to convert ASCII text input files for point coordinates or boundary file coordinates to the shape file format. It uses ESRI’s MapObjects LT2 technology for spatial data access, mapping and querying. The analytical functionality is implemented in a modular fashion, as a collection of C++ classes with associated methods. In broad terms, the functionality can be classified into six categories:

- spatial data manipulation and utilities: data input, output, and conversion
- data transformation: variable transformations and creation of new variables
- mapping: choropleth maps, cartogram and map animation
- EDA: statistical graphics
- spatial autocorrelation: global and local spatial autocorrelation statistics, with inference and visualization
- spatial regression: diagnostics and maximum likelihood estimation of linear spatial regression models

III. NEW IMPLEMENTATION IN DATA REPRESENTATION

In [4] there is shown the situation when the polygon data requires more information to represent the spatial aspect of the DataSet; the non-spatial aspect The Field no longer has ‘vertices’ dependency, but

of the data being represented is the same. Instead of a MeshCell type of PointCell, now the type is Polygon.
now has ‘cell’ dependency. Each ‘row’ of

index	vertex array
0	M1
1	M2
2	M3
3	M4
4	N5
5	N6
6	S7
7	S8
8	C9
9	C10
10	C11
11	C12

polygon	offset array	count array
A	0	4
B	4	4
C	8	4

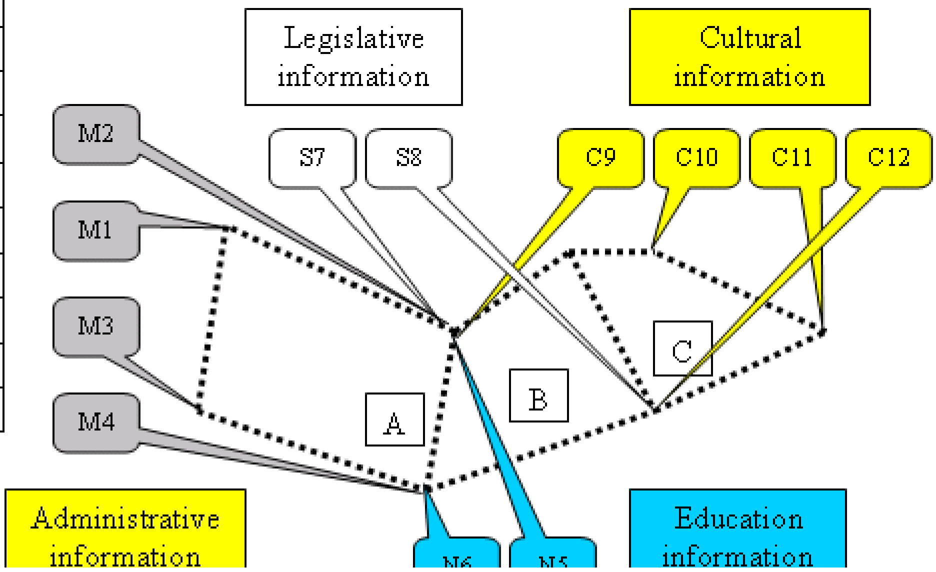

Figure 2 Data representation for errors detection

non-spatial data (one element from the data side of each Field) is dependent on a cell, not just one vertex. The different types of Connections that IGOR provides manage how the vertices make up the Polygon, allowing for more efficient representation of the vertices in memory. In the closed representation (figure 2) is a simple diagram that helps to see how the usual structures represent the polygon data [4]. This structure helps the designers to understand the data processing procedure. Each data entity is queried through different standards and criteria.

IV. PROPOSED PROCESSING METHOD

Spatial modeling and mapping of local/regional data is a relatively represented, and is placing higher demands on data quality than traditional, point-based analyses. Previous experience with spatial modeling projects has demonstrated the problems experienced with insufficiently quality-controlled (QC) data sets. A single outlier has the capability of causing spatial abnormalities, sometimes quite large and obvious. The outlier may not appear unusual in a time series plot for a single station, but spatial analyses can often show the inconsistency of the outlier in relation to values from nearby stations.

While a spatial analysis can be an effective way of identifying outliers, the detection and correction of such errors after the spatial data set has been produced can be time-consuming and inconsistent. Each spatial grid must be visually examined for possible outliers, and special calculations must be made to help show outliers where they may be otherwise hidden, such as areas of complex terrain. When possible errors are found, they must be individually verified, and the erroneous grid reproduced without the offending data point.

Temporal relationships between pairs of data coordinates have been calculated in anomaly space, that is, the variations remaining after the means had been subtracted off. While this is a generally a more stable way to express continuous and dynamic data, it requires that a stable, long-term mean value be available.

For data supplying, because of heterogeneous primary data sources, we have used:

- import/ export facilities;
- sessions for executing executable script for
    - Standard queries
    - Real time designing, running and killing temporary databases

IV.1 Integration of the real time error detection into Internet-based application

This part of the project is focused in combining real time error detection with temporary databases by running server side scripting programs, and client side fast processing enabling. Today, network-enabled consumer devices such as mobile phones or PDAs allow new user groups to take advantage of the Internet. Besides the limitations posed by these new devices – including restricted screen real estate, small bandwidth, numeric keyboard, etc. – there are also new opportunities for application developers. For instance, information services may be designed to consider the users' locations, time of the day, etc.; portability and usability of mobile devices allow for instant and ubiquitous access to information; and, content and access structures can be delivered considering the users' interests and preferences.

- Structured documents and style sheets: This approach implies that content is stored independently of the target language by using for instance the Extensible Markup Language (XML, [4]) as a declarative specification language. XSL (Extensible Stylesheet Language, [1]) style sheets can then be used to define the replacement of XML element types with tags specific to the target language. The transformation is done dynamically either on the server side upon page requests or by clients capable of doing the transformation themselves. This idea is a simplification of using Composite Capability/Preference Profiles (CC/PP, [13]) as proposed by the World Wide Web Consortium (W3C).
- ng code: Using this approach the presentation is calculated at the client side. Pages transmitted consist of content and scripting code. At runtime, the scripting code is executed and compiles an appropriate presentation of the content by generating the required target format (e.g., WML or XHTML). This approach is not feasible in situations where for instance mobile devices set restrictions in code size or computing power.
- Pre-generation: It is common practice on the WWW to pre-generate static Web pages so that they can be accessed at prime time [11]. While the WAP architecture in general does not prevent this approach it does not meet two major challenges: firstly, browsers for new mobile devices are even more heterogeneous than today's Web browsers; secondly, most E-commerce applications are expected to deliver dynamic content with a high update rate thus leading to a humble lifespan for a single static page.

First step in this implementation is focused on designing static and dynamic associated tables. Based of our experience in remote database controlling, we have applied procedures for instance table controlling, like: designing, running and killing temporary tables or databases. Such procedure is represented in next figure (figure 3) and is framed in aspect oriented programming technique.

```
static table
{.........
    {
// +--------+-----------+-----+-----+
// | Field | Type| Null | Key |
// | id | int(4) | | PRI |
// | name1 | char(255) | | |
// +--------+-----------+-----+-----+
..................}
    {
// +--------+-----------+-----+-----+
// | Field | Type| Null | Key |
// | id | int(4) | | PRI |
// | name2 | char(255) | | |
// +--------+-----------+-----+-----+
..................}
    System.out.check(result);
    }
}
```

```
class table
{.........
    {
// +--------+-----------+-----+-----+
// | Field | Type| Null | Key |
// | id | int(6) | | PRI |
// | name3 | char(255) | | |
// +--------+-----------+-----+-----+
..................}
    {
// +--------+-----------+-----+-----+
// | Field | Type| Null | Key |
// | id | int(9) | | PRI |
// | name4 | char(255) | | |
// +--------+-----------+-----+-----+
..................}
    System.out.check(result);
    }
}
```

Figure 3 Static and instance table

Based of our experience in remote database controlling, we have applied procedures for instance table controlling, like: designing, running and killing temporary tables or databases. Such procedure is represented in next figure and is framed in aspect oriented programming technique.

The modeling techniques upon which they are based are targeted at modeling functional behavior and the principle of separation of concerns is applied by organizing an application as a set of cooperating functional units (where, depending on the particular programming paradigm, a functional unit may be a procedure, a module, an object, a class, etc) see the figure 4.

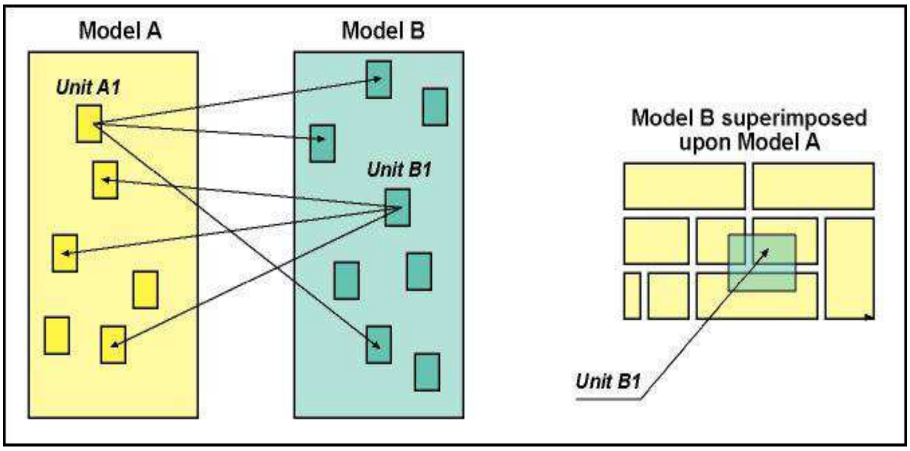

Figure 4 Error checking proposed method

IV.2 Viewing data on different computing systems

First approach for building a behavioral talk between user-side and server-side is focused on dynamic creation of content. State-of-the-art applications which support personalized presentation of content demand for dynamic content generation. This is supported on the one hand by parameterizable application manager and on the other hand by the possibility to create the content tree at runtime by the application (figure 5). This procedure is based on checking code following user setup. The applied method is a form of automatic code generation where both the starting and the end code are written in the same language. By putting the aspect oriented programming algorithm into the client-server application for GIS management, the logical diagram looks like in figure 6.

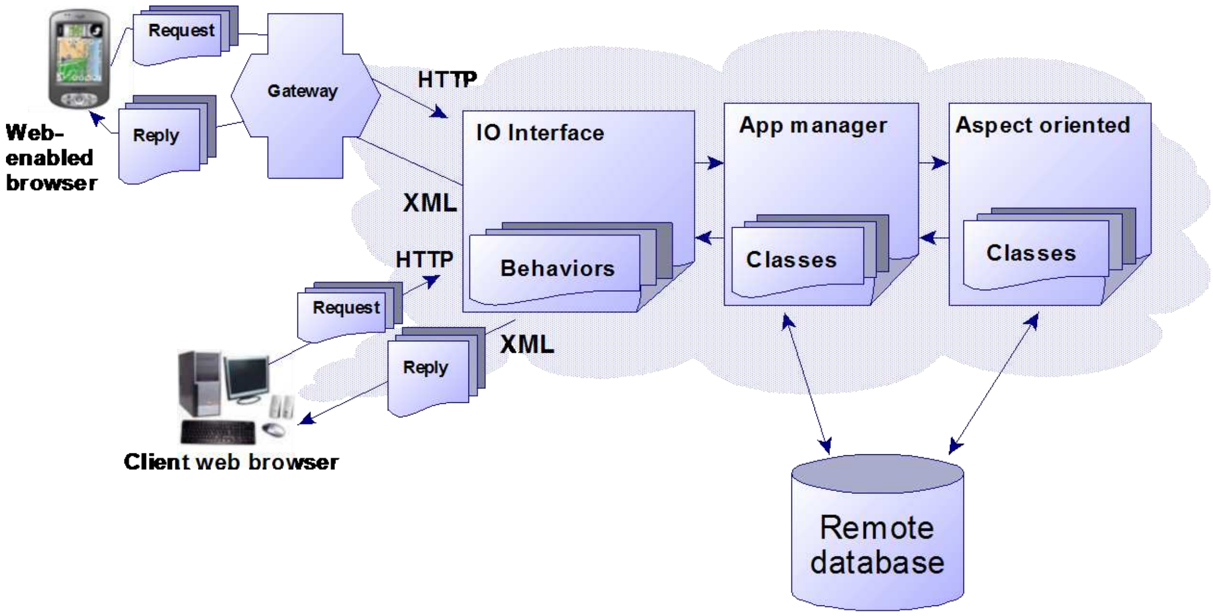

Figure 5 Application structure for error checking

Aspect oriented programming ameliorate the information exchanging between mobile device and servers database by putting into the built chain the related XSL file for generating of well-known GUI elements.

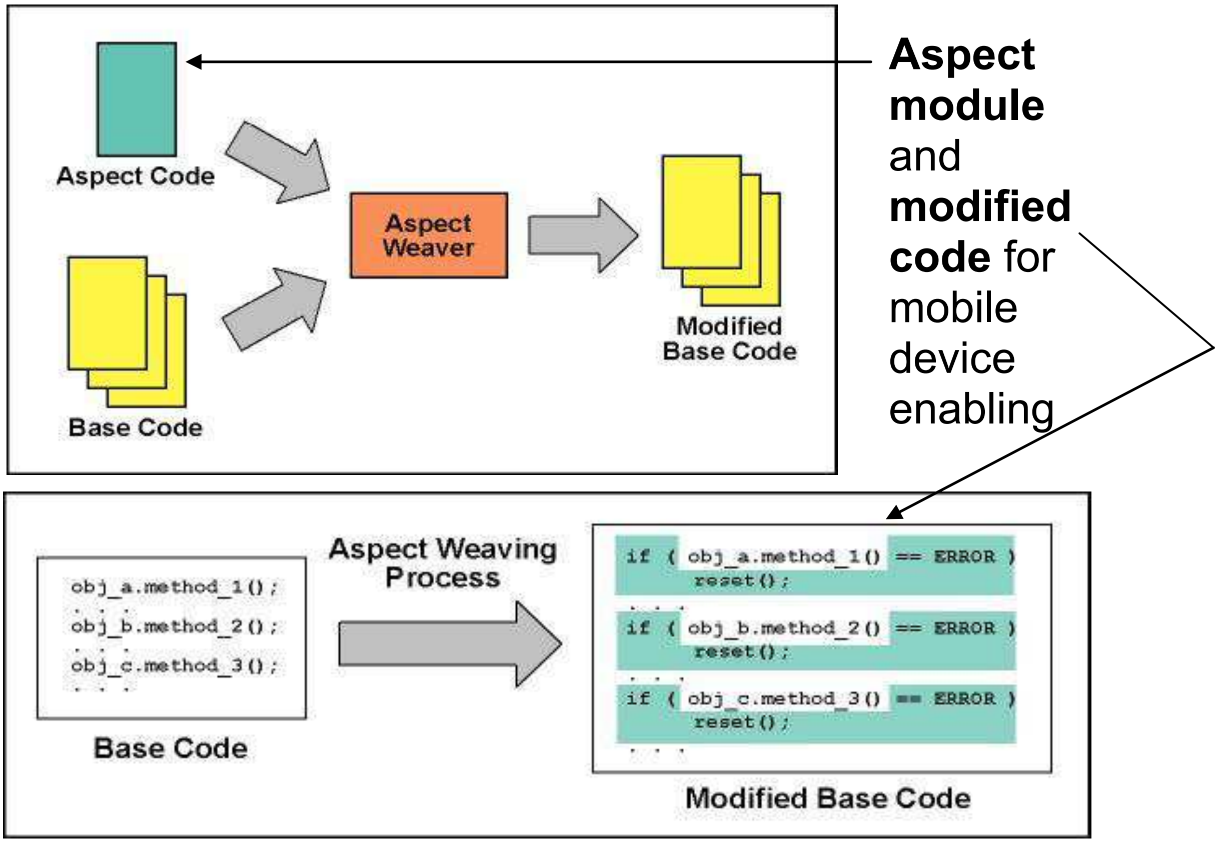

Figure 6 Diagram structure for error checking

The generated beans of information became apparent that not only primitive widgets needed to be supported but also more sophisticated ones (figure 7). With these so-called "group widgets" it is possible to represent coherent user interactions.

By that well established user interface guidelines can be implemented.

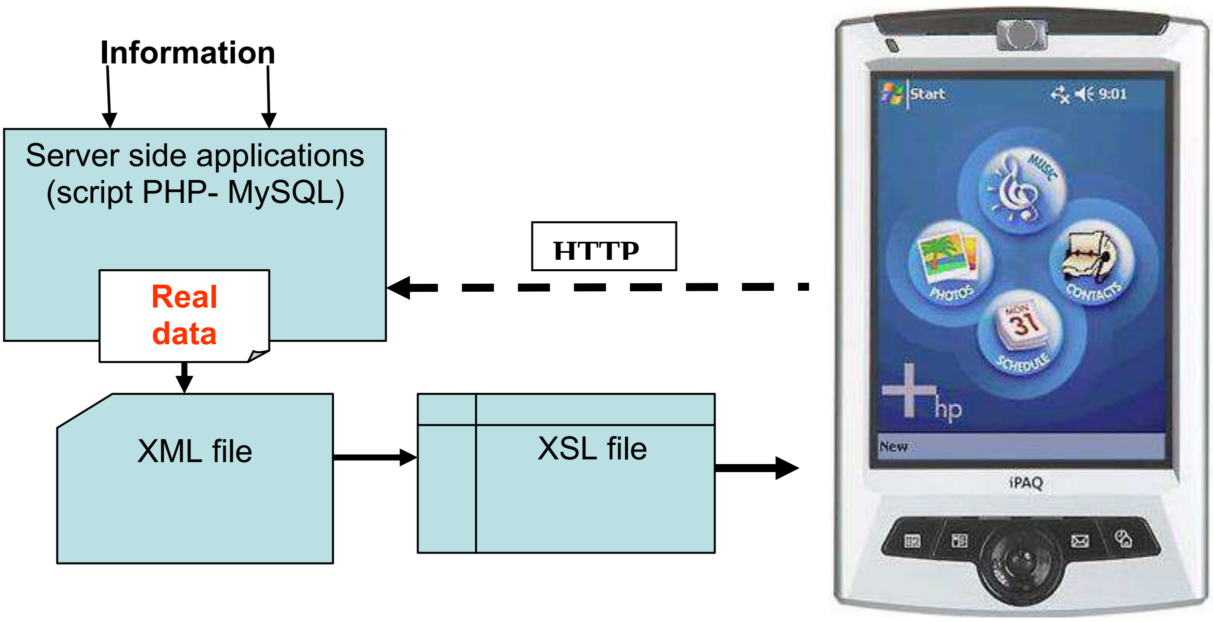

Figure 7 Flow information for end user application

V. CONCLUSIONS

The main task of the formulated project was focused in creating the basement for maximum mobility to remotely monitor and control, by allocating rights and programming facilities to the both mobile and desktop computing systems.

The harder part of the project was related to the synchronizing and interfacing the proposed setup with the existent processing implementation. By using aspect oriented programming that is derivate from object and service-based programming, we have facilitated running applications:

- at the engineering level model integration into force simulated environments with component repository building blocks;
- for developing tools and interfaces to rapidly configure models into distributed federation from mobile devices;
- for defining meta-model with data structures needed to maintain semantic consistency between models;
- for exposing interfaces in legacy simulation systems to fully leverage their capabilities;
- remote controlling decision making system.

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