CONTENT MANAGEMENT SYSTEM
AS A SUPPORT TO INTERNET AUCTIONS

Biljana Radulovic

Dragana Glusac

Zoltan Kazi

Ljubica Kazi

Kristian Beres

Abstract
This paper presents content management system as a support for internet auctions software. Paper describes types and elements of web auctions. Business model of a web auction is described. Universal model, software architecture and an example of implemented content management system as a module of software for web auction software is presented.
Keywords: Content Management System, Internet, Business model, Web auction, Software

Introduction

Internet auctions are a very popular means of business. Auction sites take the central part of many Internet sites and pages, and are one of the significant segments in electronic business with constant increase of sales. One of the reasons for its popularity is that it allows customers to compete, and salesmen to achieve maximum price. Besides, offer of goods is extremely large and various and at the global market there are always customers to be found. Other reasons for popularity of Internet auctions are free price setting and simplicity of work – it is enough to take a photograph of the item and describe it, and it already exists at the global market, without a single actual movement. All this has created almost ideal conditions for Internet auctions as one of the best businesses. The term auction originates from Latin "auctus", which means "enlargement". The Latin origin of the word explains why this method of trade has gained such popularity. In cases when the ratio between supply and demand is such that there are more goods than customers, or when for goods there are no customers, the prices decrease.

Auction trade

"Auction is a formalised trade procedure in which trading partners follow specific rules. Auctioneer acts as a middleman in this trade". Electronic or Internet auctions are only a special form of mediation.

There are two modality of selling and buying at auctions. First is when a seller starts the process by offering goods and a minimum price, and lets buyers compete to achieve maximum price for the goods. During an auction, while selling goods, a seller offers goods, states the quantity and the minimum price, as well as conditions of trade. Buyers make bids and the price increases until it reaches certain limit where the most advantageous bidder pays the highest price and gets the goods.

Second modality of auctions is starting when buyer states the need for certain goods. Buyer specifies what he wants to buy and the sellers or producers give offers for prices. In this case the price is minimised so that the one who offers the lowest price gets the bid. This way of trading is common for supplying process in some big companies. The procedure requires getting minimum three offers from different producers or suppiers in order to minimise costs.

Depending on the point of view, auctions can be:

• Coordinating mechanism - for determining relation between supply and demand for a specific product.
• Social mechanism – for goods or objects representing status symbols it is difficult to determine a real price as it is the domain of irrational and cannot be measured. Such goods are rarely sold and potential buyers in such occasions are ready to pay enormous amounts.
• Efficient mechanism of allocation – In cases when services are sold in the last moment (such as plane tickets before the plane takes off), or goods nearing expiry date.

Elements of auction trade are:

• Auctioneer – who is in charge of providing institutional frame for undisturbed auction and should make sure all auction phases follow defined rules. Phases are: information exchange, setting prices, actual trade and payment.
• Before commencing any auction trade, rules must be strictly defined and followed to the detail. Disregard of rules directly influences the reputation of an auction house, leading to loss of reputation and trust among clients.
• Objects of trade – Various objects are subject to trade in auctions. Depending on the object of trade, there are differences in trading conditions.
• Trading on the Internet requires a high level of standardisation in describing products. Bearing in mind that trading objects can sometimes be very complex, additional explanations can be needed, whereas sometimes can require precise expert explanations.
• Trading rules – Must be established and defined in advance. Rules themselves depend on the type of goods to be manipulated in trade.
• Transaction process – Includes shipping and delivery of goods as well as the process of payment. Proper treatment of this part guaranties a proper completion of the whole procedure.

Types of auctions:

• English type of auction – Type most commonly used in English auction houses Sotheby's, Phillip's and Christie's. An auctioneer starts the sale offering the lowest acceptable price. Participants make a bid after bid, each time increasing the price in comparison with the previous price. The auction is closed when no participant bids higher price than the previously set one, or, in case that the previously set purchasing price was reached, then the next highest bid wins. A seller can set a minimal price, and, in case the minimal price was not reached, the object is not sold. There are three methods of increasing price during these auctions: auctioneer increases the

price step by step, buyers make bids, or the combination of the two.

• Dutch type of auction – In traditional Dutch auctions, auctioneer sets a high price which is gradually lowered until some of bidders accept the auction price, or if previously set minimum price was reached. The winner pays the last declared price. Dutch auction is used for a description of on-line auctions, where several identical objects are sold simultaneously to equal number of strongest bidders.

• Silent auctions (first price bidding) – In this type of auction bidders simultaneously submit sealed bids, so that other bidders do not know what price is offered. The highest bid wins. In this type of auction it is possible that more bidders offer the same price. This type of auction consists of two parts, first when the bidders submit their bids, and the second when the bids are opened and the winner is decided. Potential problem in this type of auction can be the existence of more items in auction, or the number of winners. If there are more items in auction, not each winner will pay the same price, but the first will pay the highest price, and all the others – lower prices. That is why this type is a so-called discriminatory. This type of auction exists in the USA, where the state, in this way, sells its debts.

• Vickrey auction type – Named after William Vickrey, Nobel prize winner in 1996. Auction is carried out in such way that the bidders submit their sealed bids, without knowing what the bids of other bidders are. The highest offer wins, but the price is determined on the basis of the first lower bid, which is in fact paid. If there are same items on sale, all the rest are sold at this price ("the highest losing price"). The idea of this method is to reduce the drawbacks of the previous models when more items are on sale. In the previous model the prices move from the highest to lower. In this model, not the highest price is paid, but all the rest are equalised, which leads to general increase of income. Besides, the bidder suffers no mental strain that he will pay the highest price which would not be reasonable. It is especially important that the bids are sealed because otherwise auctions would be easy to fake. This type of auction is eBay (www.ebay.com).

• "Auction cut" is a process of monitoring an on-line auction with a time limit, i.e. on eBay or Yahoo!, and putting a winning bid in the last possible moment, often literally in the last second of the auction, so that other bidders cannot surpass the last bid. Some bidders use software designed specially for that purpose, such as Auction Sentry and Ebay Sniper.

Web sites for auctions

Systems of work on auction sites partially differ from one site to another, but the main principle is much the same. A visitor who wants to take part in an auction has to register on the site first, and then gets a username and password. If he only has the intention to browse the site, the registration is not necessary. When the seller registers the sale, he determines the lowest price for his goods. In some cases there is an option that the starting price is not set, but then the time limit for the auction process must be given. Goods are sold at the price reached during the defined time frame. In some cases the maximum amount is set within which the price could be increased. From advertising point of view, each seller is trying to present his product the best he can, so that each auction object is accompanied by product description, its picture or additional explanation. Different options are available for users. One is that the price increases automatically, as soon as somebody makes a better offer. Normally, there is a possibility to limit the offered amount. On some sites it is possible to attend at all auctions connected to a certain product. One of very useful services is communication with other registered site users, either by e-mail or at forums. As this trade segment is constantly developing, it is to be expect that the number of available services for traders and users will continually grow.

So many sites deal with auctions and auction sales and they can be considered one of the most expansive businesses on the Internet.

There are many reasons for that:

• Communication infrastructure with millions of potential buyers and business partners and possibility of global performance. Possibility of auction at such highly specialised markets for individuals and groups rarely exist in public.

• Standardized hypermedia presentations of trading objects enable simplified description of the product. These presentations are simple to manage and easier and more economical for work.

• Development and spreading of standard searching mechanisms are independent from auction business and do not present extra problems.

• Payment systems are mostly developed and safe enough. If payment is made through a safe system of credit cards, there are almost no risks for the user. Besides, it is possible to make financial transactions on the sites which guarantee quality and safety, which increases the level of confidence. eBay.com, amazon.com and other sites work with Tradenable (iEscrow.com), which is one of the biggest security services. All these sites are designed to protect the user during the whole on-line transaction. These sites also protect sellers from unscrupulous buyers. Their principle of work is such that they retain payment until they are authorised or refused to make the transaction, or until specified time for the transaction has elapsed.

• Auction is a process of selling and buying goods and services presented as an offer for bidding. Selling is performed to the bidder with the highest offered price. Auction is a method for establishing price of goods with uncertain or changeable price. Auction usually starts with a price for the minimum value of the product, bidding must continue with a higher price in order to find a buyer for the product. Auctions which do not have a starting price guarantee sales and the bidding process sets the price of the product.

Business model of a web auction

Business model of a web auction includes biddings for a product or a service via the Internet. Functionality of selling and buying in auction format is made possible in form of an auction software for regulating various processes of an auction. A typical example of a web auction is eBay, the biggest web auction site on the Internet in the world. As most of the companies, eBay does not actually sell goods, it processes information and presents goods, enables bidding as well as payments. eBay has a function of a market for private and legal entities, i.e. companies, which use the site to put their products and services at auction. There are several types of auctions possible on the Internet, English type, Dutch type and their variations. Almost all Internet auctions use the English auction type.

Strategic advantages of a business model of web auction:

• There are no time limits – Bidding can be made at any time of the day, twenty-four hours a day, seven days a week. Products are exhibited for several days so that the buyers can have time for browsing, and to enable them to form their offers. This advantage drastically increases the number of biddings.

• There are no geographical limits – Seller and buyer might interact regardless of their location, the only prerequisite being access to the Internet. This advantage increases accessibility and lowers the costs of presence at auctions, which leads to increase in the number of auctions as well as buyers. The goods purchased do not need to be transported to a central location but directly from the seller to the buyer.

• Intensity of social interaction – Interaction of people involved in the auction process is very similar to gambling. Buyers, i.e. bidders wait for the decision of the auctioneer to announce the winner (eBay actually calls the buyer a "winner").

• Large number of bidders – Due to potentially low price, a large

number of products and services available, easy access and social gain from the auction process, there is a large number of bidders.

• Large number of auctioneers – Due to a large number of bidders, potentially high prices, lowering sales costs and easy access, there is a large number of auctioneers.

• Sellers and buyers network – Large number of buyers automatically attracts a large number of sellers, which forms a virtual cycle: more buyers means an increase in the number of sellers, which leads to an increase in the number of buyers and so on. Value of the system increases with the increase of the number of users.

• Captures consumers' surplus – Auctions are a type of the first level of price discrimination, and as such have a tendency to transform the saving of the buyer into the profit of a seller. Web auctions are an efficient way of discrimination in setting prices.

Content Management System (CMS)

CMS is a software system which helps users in the process of content management. Web CMS is content management which makes publication of web content, i.e. contents of a site easier. Web CMS is often used for input, control and publication of certain documents, such as news, manuals, marketing brochures, product information etc. CMS of a web site is often located on the site server. Most systems enable access control to different levels of users, such as administrators, users, content creators. Access is usually made via web browser programs. Content creators load the information into a system and the system administrator is in charge of all information circulating through the system, he allows it, censors or rejects it. CMS controls and helps each step of an operating process, including technical operations of publication of documents to web sites. The complete content and other information related to a site are stored in a relational database.

Auction CMS is a software which controls all aspects of a web auction functionality. This CMS must follow auction and sales logics by certain model. ACMS controls the input on new users, i.e. their information, process of opening and running an auction, bidding, processing the winner of an auction chosen by auctioneer, sending data relevant for payment to a third party application for processing and verifying payment, and after payment verification ACMS approves of, or informs the auctioneer that the payment has been made. Web auctions are based on web technologies such as PHP, ASP.NET, Cold Fusion, JSP etc., as well as database MySql, MSSQL etc.

CMS-module is a web site section autonomous from the rest of the system and it is integrated into a system, i.e. added to other modules which together form a whole system. The logic of an Internet auction itself is simple. CMS on users side must have following basic functions: to frame all the sections which are connected to direct influence of visitors on the system and its content, that is: protection from unauthorized access, opening auctions and bidding is allowed only to registered members of the system, option of auction winner selection, process of acceptance for purchase by a buyer. CMS by the administrator has access to information given on a product or service, registered members, possibilities of contacting each registered member by e-mail.
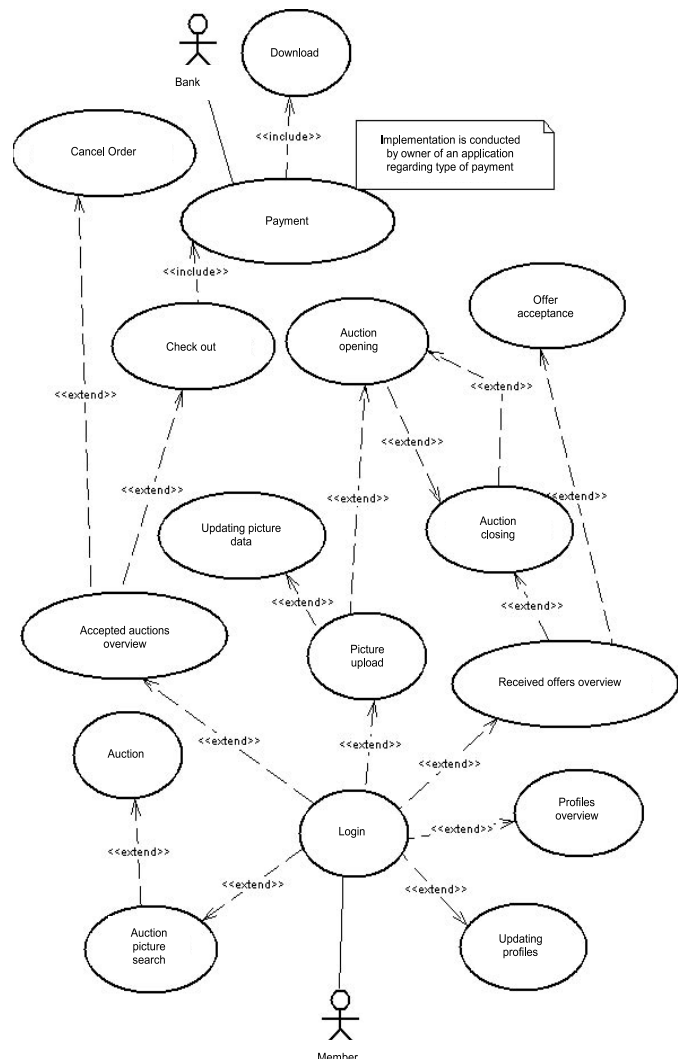
Web auction software

Web auction application consists of two parts: front end and back end for administration.

a. Front end – For review of site content, photograph search by key words or categories membership is not required, but participation in any of auction processes is not allowed. A visitor who wants to take part in an auction has to register, when he enters his personal details, functional e-mail address and password and after registration these two details are e-mailed to the new member. To log-on, it is necessary to enter e-mail address and password. When the user is logged-on, he can bid at all open auctions, or he can open an auction by entering data about a photograph, its starting price and the photograph itself. Following the upload, it is necessary to open an auction for a certain photograph by setting the closing date for the auction. It is possible to close the auction before the closing date, or choose a winner. The winner gets the information by e-mail that his bidding price has won and is asked if he continues with payment procedure or quits; in case the buyer decides to buy the photograph, after the payment he gets access to take the photograph. If he decides to quit, the auctioneer can choose another winner. Photographs can be distributed into directories, which can be created by a user for easier management. During registration, directory "Home" is automatically created, which cannot be modified or deleted; in case a directory is deleted, all photographs from that directory are automatically sent to directory "Home".

b. Back end – Administrator logs-on by e-mail and password. Administrator has options for manipulation, i.e. add, delete, change category list, country list, choose a global language, as well as add a file for other languages and delete it. He has access to all photographs, both those at auction and those which are not. He can change information about a photograph if it is not at auction. He can delete an auction, when the system e-mails the member that the auction is unacceptable. Administrator also has access to all members and their data and can contact a member by e-mail.

Figure 1
Use case diagram of a web auction
by a registered user

There are three types of users of this application, 1) Visitor, who does not have a registered order and is therefore limited to basic functions of the software, with no right to participate at an auction. 2) Member or user who has a complete access to all auctions and the right to bid. 3) Administrator.

To take part in an auction, it is necessary to become a member. It is achieved by filling in a form for registration of new members. It is necessary to fill in all the spaces and choose whether the order will be private or public; that is whether the information will be shown or not. After the registration, the application sends a message of successful registration together with application information, i.e. login to the site – e-mail address and password, by the given e-mail. Username or alias in a database must be unique; there cannot be two aliases in a database. When a new member is registered in a member directory, a directory with his alias is opened on a server, and within that directory two more are opened: photos and thumb. Photos will contain all the uploaded photographs, and thumb will consist of small copies of the original which will be shown on the site. Following a successful registration, the member, with his e-mail and password, registers for the site and is allowed to participate completely in the process of auction and bidding. He can put pictures on the server, open auctions, sort the photographs, have access to all biddings and auctions.

To put a picture on a server it is necessary to fill in the form for upload of photography. Title of the photograph, description, key words and the category are the fields included into search process as objects of search. It is important to fill in the field representing price, which is, as in English type of auction, a starting price for bidding. In the end, it is necessary to provide the right path to the location of the photograph. During the upload process, type of photograph is checked, allowed types are .bmp, .jpeg/jpg, .gif. While uploading the photograph, the application automatically generates a small size picture which appears on the site and can be seen by all members. This solves the problem of upload of the original and small size picture, which the user would have been supposed to make himself and which could have a negative impact on simplicity of use of the application.

After the successful upload of the photograph on the server, alteration can be made to the description and starting price. Photograph can be deleted from the server, or an auction opened. To open an auction, a closing date for the auction should be chosen. Once opened, there is an option to temporary close and reopen the auction unless the closing date has not expired. It is possible to delete an auction, but it is previously necessary to close it. When an auction is deleted, another can be opened, data can be changed or photographs can be deleted from the server.

Bidding is performed so that the members compete who will offer a higher price. Auctioneer does not have to choose the highest price, he chooses by his own criteria and can choose the highest as well as the lowest offered price. It is not possible to make bids lower that the starting price. If the auctioneer has chosen the winner, the auction is closed and marked as an auction with a winner. If the auction exceeds the time limit and the winner of the auction has not been chosen, information is received that the auction elapsed.

When the auctioneer establishes the winner, he allows buying and the buyer receives a message that he won the auction and is asked if he wants to proceed with process of payment. In case the buyer decides to make a purchase, after the payment he gets access to take over the photographs. If the winner of the auctions decides not to buy and the bidding time has not elapsed, the auction is continued and the bidding which won but quitted is marked as such. As the auction is continued, auctioneer can chose another winner so that setting prices and sales are more likely to end in purchase.

This application is session based, i.e. it uses cookies that are placed on server. For security reasons standard cookies on user's local are avoided, which means that memorizing login parameters is not possible. The application uses one-way irretrievable cryptic MD5 and a random key which can be changed. MD5 Hash function - Hash function includes mathematical functions which, based on input message generate values of fixed length, so called hash value, message digest, or message fingerprint incoming messages. Result of a One-Way-Functions is a digest of 128 or 160 bits. It is practically impossible to get two identical digests. This technique of data integrity check is very reliable(Gutmans, Sather, Rethans, Rethans, 2005). Parameters defining a page and its functions are cryptic so that the user on URL path never sees the exact title of the page. The great problem of transferring data related to users from one page to another by sessions is solved using one-way cryptic solution of user id in database, password, e-mail, session_id, which form a character line defined as 'uniqueid'. When a user logs on, his 'uniqueid' is generated and written in the database and session.

Each new log-on generates different 'uniqueid' from the previous, so that the user is allocated a 'uniqueid' which is valid as long

Figure 2
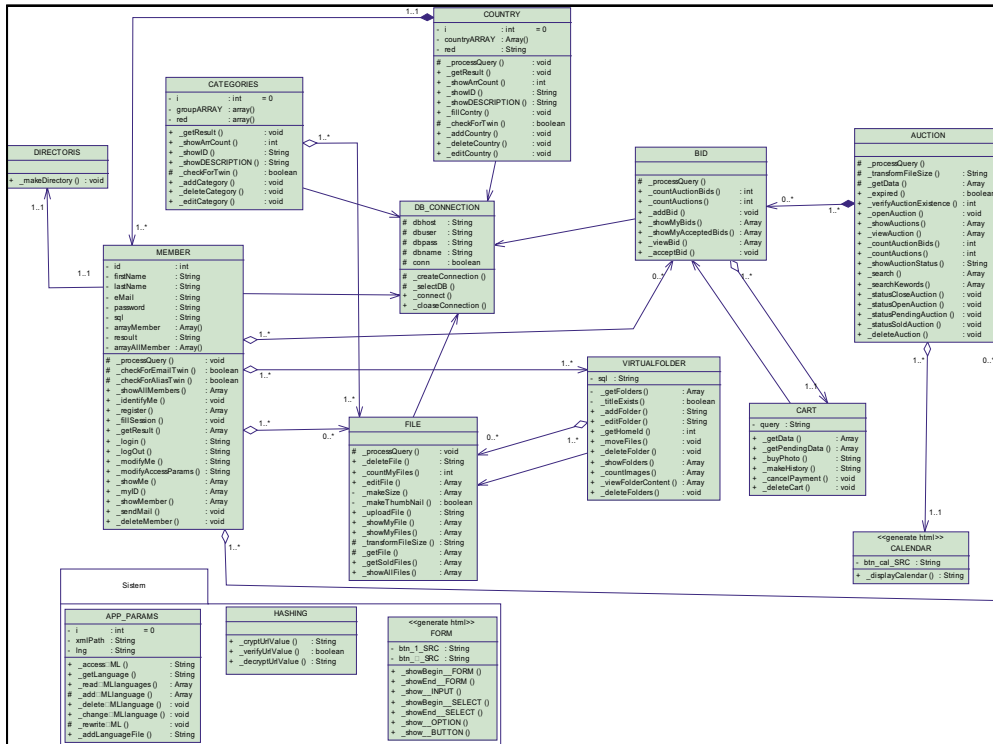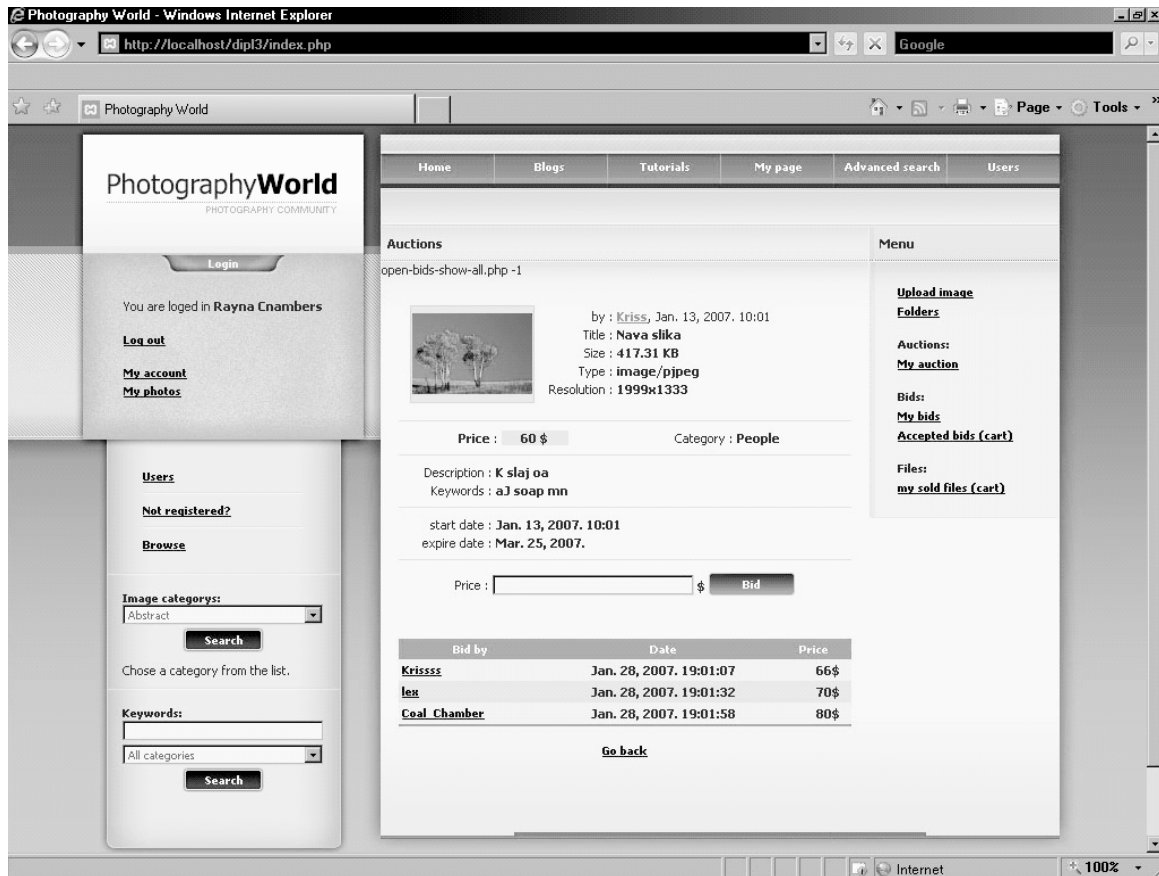**Class diagram of a web auction software**

Figure 3
Web page for bidding

as his session. Each page checks the authenticity of data from session against database and allows or restricts access to protected content accordingly. Photography upload is processed when path to photography is confirmed. First, the photograph title is checked against allowed characters and if it is of adequate type, and the requirements being fulfilled, dimension (height and width) of the photograph are detected and put into user's directory. If the allocation of the photograph is successful, all the details about the photograph are entered into a database and method for generating small size picture to be seen on the site is used. Dimensions of a small size picture are defined in config.php file. As the application itself has to generate a small size picture out of the original, problem of black picture usually occurs during this procedure. Namely, this problem appears when temporary data on photograph tmpName is used or if the photograph has not been allocated to the right address. This problem is solved so that instead of using tmpName as a temporary allocation on a server, the photograph is first allocated and then its absolute path is taken. Application supports only one language option, being aimed at the global market where English language is expected and where multilingualism would lead to multilingualism of auctions, which would confuse the users. However, at the administrative part there is an option for change of language. If the application is aimed at a local market, such as a market in Serbia, it is possible to change the language into Serbian if it is expected for a user to open auctions and provide descriptions for photographs in Serbian. That is why the application has a separate file which contains all the titles and all the texts and allows the possibility of translating into any other language.

Conclusion

The aim of this work is to present theoretical aspects, models and implemented web application for auctions software support. Basic elements of auction process are described. Different aspects, modalities, types and mechanisms of auctions are presented.

Characteristics of web sites that are used for auctions are described. Business model of web auctions is explained. Examples of existing web auction sites are presented. An architecture of web auction software, as well as content management systems as its module is explained. Finally, an implemented solution is presented by using UML diagrams and web application user interface screen shots. The implemented solution is developed by using Apache/PHP5/MySQL technology.

Implemented solution is based on universal model of web application that support an auction of any product or service. For different usage aspects, the model requires minor changes in the field of payment verification and receiving goods. Most "third party" applications deal with this problem by using services of www.PayPall.com which in the payment process keeps the money paid in "quarantine" until the buyer confirms the receipt of goods or services. Future improvement of implemented solution could include: scoring member services and ranking members by reliability, possibility of making comments, "feed back" on experiences of doing business with sellers and buyers, as well as extending auction types.

References

Avison, D., Fitzgerald, G., (2003): Information systems development, methodologies, techniques and tools, McGraw-Hill, ISBN 0-07-709626-6.

Booch, G., Rumbaugh, J., Jacobson, I. (1999): The unified modelling Language User Guide, Addison-Wesley, ISBN 0-201-57168-4.

Gutmans, A., Sather, S., Rethans, B., Rethans, D. (2005): PHP5 Power Programming, Prentice Hall, Professional Technical Reference Indianapolis, IN 46240, www.phptr.com , ISBN 0-131-47149-2.

Ivkovic, M., Milosevic, S., Subic, Z., Dobrilovic, D. (2005): e-Business, University of Novi Sad, Mihajlo Pupin Tehnical Faculty, Zrenjanin, Serbia ISBN 86-7672-031-2.

Radulovic, B., Kazi, Lj., Kazi, Z., (2006): Information systems, University of Novi Sad, Mihajlo Pupin Tehnical Faculty, Zrenjanin, Serbia, ISBN 86-7672-066-5.

Web References

Auction, www.wikipedia.com

Auction software, www.wikipedia.com

eBay, www.wikipedia.com

Online auction business model, www.wikipedia.com

Vaskovi, V:, Auctions on the Internet, http://www.e-trgovina.co.yu

Lucking, D: Auctions on the Internet, Whats Being Auctioned, and How?

Content Management System, www.wikipedia.com

Biljana Radulovic PhD
associate professor
University of Novi Sad, Serbia
Mihajlo Pupin Technical Faculty, Zrenjanin
Djure Djakovica bb, 23000 Zrenjanin
+38123550515
bradulov@tf.zr.ac.yu

Dragana Glusac PhD
assistant professor
University of Novi Sad, Serbia
Mihajlo Pupin Technical Faculty, Zrenjanin
Djure Djakovica bb, 23000 Zrenjanin
+38123550516
gdragana@tf.zr.ac.yu

Zoltan Kazi MSc,
teaching assistant
University of Novi Sad, Serbia
Mihajlo Pupin Technical Faculty, Zrenjanin
Djure Djakovica bb, 23000 Zrenjanin
+38123550516
zkazi@tf.zr.ac.yu

Ljubica Kazi MSc,
teaching assistant
University of Novi Sad, Serbia
Mihajlo Pupin Technical Faculty, Zrenjanin
Djure Djakovica bb, 23000 Zrenjanin
+38123550516
lkazi@tf.zr.ac.yu

Kristian Beres
University of Novi Sad, Serbia
Mihajlo Pupin Technical Faculty, Zrenjanin
Djure Djakovica bb, 23000 Zrenjanin
+38123550515