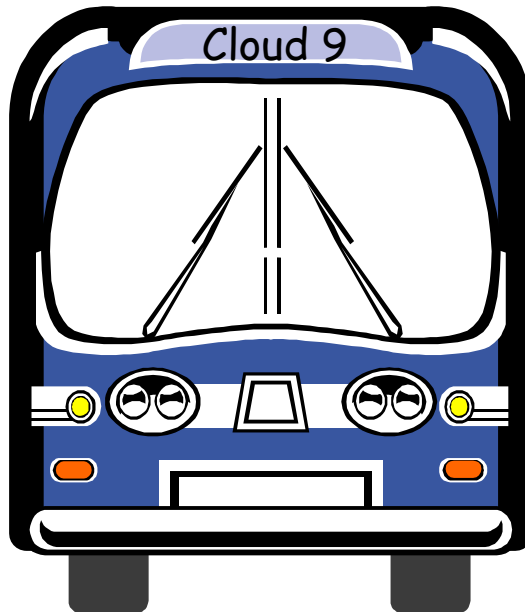


CIS*4300 Human Computer Interface Project



iTakeTheBus

A system for delivering concise and accurate transit information on demand.

November 22, 2002

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Executive Summary

The preliminary polls indicated a strong need among the University of Guelph students for an interactive system providing bus scheduling information, which would be available either via the web or via computerized kiosks located at bus stops. The main goals of the system named *iTakeTheBus* are to make the public transport easier to use for the Guelph students, residents as well as the tourists and to increase the accessibility and exposure of the City destinations, e.g., the cultural points or businesses. The system will be accessible via kiosks mounted at bus stops and via a web-based interface. This documentation presents the design of the user interface of the *iTakeTheBus* system in four sections: *Proposal*, *User Needs*, *Prototype*, and *Discussion*.

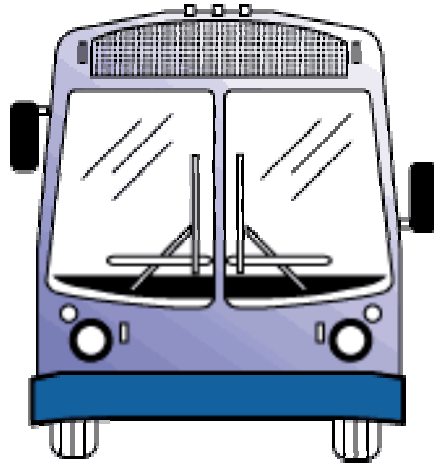
The *Proposal* section presents a preliminary analysis of system stakeholders and discusses any possible social or ethical considerations. The results of the stakeholders' surveys are summarized in the appendix. They clearly indicated a need for the *iTakeTheBus* system. Finally, a comprehensive timeline for the development of the system's user interface is outlined.

The *User Needs* section presents the analysis of needs of the *iTakeTheBus* users, lists the use scenarios, and provides hierarchical analysis of the main user tasks. A detailed analysis of existing systems is presented for the Prague Public Transit system, which features several options desirable in the proposed *iTakeTheBus* system. The usability requirements are identified as the key *iTakeTheBus* requirements.

The *Prototype* section describes the prototyping of the kiosk interface. The kiosk interface was designed first because it is more challenging relative to a traditional web application and, therefore, carries more design risk. Two prototypes of the kiosk interface were constructed and tested in a series of interviews. The end users appreciated the simplicity of the design, the option of specifying the arrival times, and visual tools including a scrollable map.

The *Discussion* section reflects on the process of designing of the *iTakeTheBus*. The creators of the *iTakeTheBus* consider the main concept of providing the transportation information on demand along with the user-acclaimed prototype of the user interface to be the main achievements. This was a result of appropriately selected and timely executed methods like task analysis, top-down design of the prototype, inclusion of the user feedback, and the iterative lifecycle. As a further step, the prototype evaluations, stakeholder interviews, and the existing system analysis should be expanded. The further development of the system may also include design of the web interface and consider the connectivity to other systems, for example, the inter-city transportation information systems.

CIS*4300 Project Proposal



iTakeTheBus

A system for delivering concise and accurate transit information on demand.

October 4, 2002

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Executive Summary

The public transportation system at Guelph consists of 14 routes. As the preliminary polls indicate there is a strong need among the University of Guelph students for an interactive system available either via the web or via computerized kiosks located at bus stops.

The proposed system, named *iTakeTheBus*, will allow riders to obtain the location of the nearest bus stops to their starting position and destination, choose the most convenient bus route, and obtain the time of arrival of the selected bus. It will be accessible via kiosks mounted at bus stops and via a web-based interface. In addition to Guelph, the system can also be easily deployed for transit systems in other cities.

The attached proposal outlines how the *iTakeTheBus* system will be developed. A preliminary analysis of existing systems and stakeholders for the system is outlined and any possible social or ethical considerations are discussed. The results of the surveys are summarized in an appendix. They indicated a need for the system. Finally, a comprehensive timeline for the development of the system's user interface is outlined.

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1. Vision

Reliable and efficient transportation is one of the fundamental aspects of modern society. For some of us the car provides our primary source of travel, but this is starting to change. With the renewed focus on our environment, alternate transportation arrangements are becoming more important. The chief mode of transport that stands poised for renewed growth is public transit. The transit systems of today have begun to adapt and are now more comprehensive than they have been before. However, there remains still one major hurdle. It is still time consuming for the experienced rider, never mind the neophyte, to figure out how to use the system and its many routes, times and schedules efficiently. Guelph is no exception to this issue.

Figuring out what bus, subway, or streetcar can be a daunting task for even the seasoned rider. In the past there were cryptic printed schedules and complicated maps to fulfill this role, which almost always meant unsatisfactory experience for the rider, and often served to alienate many possible users of the system. Our product, *iTakeTheBus* seeks to change this.

iTakeTheBus is a kiosk and web-driven system whereby the wayward traveler can input his/her destination and then find out exactly what buses to take and when it will arrive. Whether delivered by a kiosk conveniently located at a bus stop (e.g., at a shopping mall) or accessed via the web at home prior to embarking on a journey, *iTakeTheBus* will make using public transit much easier. No longer will prospective riders have to fiddle with complicated maps or out-of-date schedules, they can instantly get the transit directions they need on demand.

2. Background

2.1 Public transit information system currently available at Guelph

The public transit system in the city of Guelph consists of fourteen bus routes. Most of these routes start in downtown Guelph and extend outwards. Detailed maps with bus routes are available on the city website [1]. Bus schedules and the route map can be also purchased at various locations. Additionally, the route scheduling information can be obtained from the bus drivers and also from the information desk in the University Centre. In the past, the bus schedule was also available via a phone on a so called Telerider system. Currently, no automated route scheduling system is available on-line or via the telephone.

The bus routes often start and end in the downtown Guelph, and the passengers can transfer from bus to another at several locations. Riders often assume they can only transfer buses at the downtown square. This may not always be optimal since some routes intersect at different locations; often an alternative route is more time efficient. This may, however, require certain planning and an automated route selection system would simplify this task.

2.2 How the proposed system fits into the current environment

For bus riders, the system will be accessible via two methods. The first is via kiosks that will be installed at bus stops. The kiosks will have a simplified interface which is used by one individual at a time, with the focus on getting the requested information to the user as quickly

and easily as possible. The second method to access the system will be via a web browser on a user's own personal computer. The web interface will be much like the kiosk but will allow for a more feature-rich interface. The kiosk will provide information to the rider who is in the midst of their journey, while the web-interface will help the rider who is planning their trip before they depart.

As the *iTakeTheBus* system is developed further user input will be gathered. If survey data can be collected to support it, other possible methods of deployment may be investigated. These possible further directions include making it accessible via PDAs (as either a standalone application or via wireless connection) or involving cellular phone access. Cellular phones currently have both WAP and SMS technologies which may be worth considering if a user need is identified.

3. Stakeholders

Large-scale issues such as public transit call for large amounts of invested interest along with time, planning and cost. The *iTakeTheBus* system encompasses a demographic that spans the entire city of Guelph. A myriad of people have stake in the success of the project and consequently each must be considered when developing the system.

The following sections outline the potential stakeholders of project. For each stakeholder we will explore their role in the system, how they will benefit from its implementation, what they have to gain, and how large each group is. The majority of the stakeholders are the riders themselves. As a result, the riders have been further categorized based on how they use the transit system.

3.1 Experienced Riders

Role – Experienced riders have intimate knowledge of the transit system.

Benefit - They will stand to gain knowledge of the few routes and locations they did not know exist. Efficiency will be a key concern, as their experience with the transit system will require less use of the system relative to the other riders.

Demographic – These users will not be the primary audience for *iTakeTheBus*.

3.2 Frequent Riders

Role – Frequent riders are frequent users of the transit system.

Benefit – These riders know their own routes very well, but there are parts of the system they do not know very well. With *iTakeTheBus* they will now have easier access to the entire city transit system. Questions pertaining to scheduled arrival and departure times along with routes could be easily answered.

Demographic – The regular riders comprise a key demographic for the *iTakeTheBus* system.

3.3 Casual Riders

Role – Casual riders infrequently use the transit system and often need directions.

Benefit – The few experiences with the city’s transit system would be pleasant. Constant questions due to the riders’ lack of experience with the transit system could be easily answered.

Demographic – Large demographic and potential for using the *iTakeTheBus* system.

3.4 Tourists

Role – Tourists have no previous knowledge of the transit system.

Benefit – Out of city residents with no or little prior knowledge of the city’s transit system stand to benefit most from the system. The system’s ability to handle point A to point B type questions would serve the Tourists well.

Demographic – The Tourist demographic is potentially large depending on which city the *iTakeTheBus* system is implemented in.

3.5 Destination Proprietors & Local Businesses

Role – Desire increased visitor traffic and wish to be considered a destination within the system.

Benefit – Businesses will receive increased advertisement exposure to a wide variety of patrons using the system. Local establishments could be promoted, increasing the traffic to their establishments. There is a possibility that a portion of the maintenance and overhead costs could be covered by these groups of businesses; the more businesses that invested in the system, the lower the operating costs.

Demographic: Indirect user of system.

3.6 Transit Department

Role – Operator of the transit system

Benefit – The *iTakeTheBus* system simplifies intercity transit, which will directly show the city’s transit system in a favorable light. The Transit Department will also see an increase in revenue as they gain more patrons through the simplicity of public transit.

Demographic: Not applicable.

3.7 Funding Party (or public funding agency)

Role – Pays operating costs of system

Benefit – Wants a simple-to-use system that has few operating costs and low maintenance costs. *iTakeTheBus*’s simple interface and design will keep costs down and promote high usage by riders.

Demographic: Not applicable.

4. Community Impact

The system will be deployed for community use and thus community impacts must be considered.

4.1 Social and economical impacts

The proposed system can make the public transportation more attractive to larger segment of the population and, in turn, increase the use of the transportation system. This would lead to a less frequent use of passenger cars, which would have a positive impact on the environment and the human health.

Greater exposure of the public transport may also positively influence the tourism and local businesses and have an economic impact on the community. On the other hand, the implementation of the system may affect the community taxpayers based on the funding formula. Additional social issues include eventual loitering issues at the bus stops and nearby the computerized kiosks and the related street clutter concerns.

4.2 Ethical impact

Any usage data from the system will have to be carefully handled. Many users have significant privacy concerns about the usage and handling of usage data that could possibly reveal what sort of destinations they frequent. The way that usage data is employed will have to be carefully investigated.

4.3 Impact on other services

Many existing or planned services can benefit from the proposed system, for example, the tourist and travel offices. Furthermore, the system can be interfaced to inter-city transport information systems and various on-line directories.

5. Proposed Timeline

Deadlines	Process	Task
Oct. 4, 2002 (Fri)	Week 4	Proposal Due
	Week 5	Develop several possible user need scenarios Write survey to isolate top user need scenarios Conduct survey with small sample size of most likely users
	Week 6	Identify top two user need scenarios Identify areas of refinement for scenarios Conduct additional interview/surveys as required Develop concise definition of user requirements for two scenarios Write "User Needs" document

Oct. 18, 2002 (Fri)	Week 6	User Needs Due
	Week 7	Develop a few possible prototypes Create mock-ups for each using the same media Survey at least ten people and gather feedback on alternatives (show only two prototypes to each person to ensure reliable comparisons)
	Week 8	Create one final prototype based on feedback Subject final prototype to user review if time permits
	Week 9	Refine prototype and finalize Write report
Nov. 8, 2002 (Fri)	Week 9	Prototype Due
	Week 10	A) Develop and rehearse demo for prototype Perform demo and deliver presentation B) Create outline for final report Review previous deliverables to ensure continuity Develop Framework and core ideas for report Begin writing sections C) Design poster and select which information to include
	Week 11	A) Meet to reflect on success of project Write report. B) Put together parts of final report and edit first draft Review and polish final draft of report C) Select data from final report for poster Layout and edit poster Print poster
Nov. 22 (Fri)	Week 11	A) Discussion Due B) Final Report Due C) Poster Due

6. Summary

iTakeTheBus is a system that will enhance the accessibility of the Guelph transit system to its present and prospective riders. The system will be accessible via specially designed kiosks located at bus stops and via the web from any Internet-connected computer. Besides providing immediate and interactive access to transportation information, it will also offer a high level of value and return-on-investment for the transit department and funding agency. Public transit is a core service in a community that needs to be easily available to its citizens. The *iTakeTheBus* will provide the vital communication link to make this possible.

7. References

[1] Transit Services section of the City of Guelph website
<http://www.city.guelph.on.ca/document.cfm?category=390>

Appendix A: User Need Survey

In order to demonstrate the need for the *iTakeTheBus*, a survey was developed in order to assess the direction finding needs of transit users. A total of ten individuals were contacted and each was asked fourteen questions. The planned directions and goals for *iTakeTheBus* were developed from these questions.

A.1 Survey Questions

The following questions were posted to all respondents:

- a) How often do you ride the bus?
- b) Where do you go the most?
- c) How often do you need directions?
- d) How do you get directions?
- e) Would you use a kiosk with bus directions?
- f) If you were at a bus stop would you prefer a computerized/interactive schedule or a printed schedule?
- g) How often do you have a computer accessible when you need the directions (e.g. at home)?
- h) How often do you use the computer/internet/Web to retrieve travel information/directions?
- i) What would be your preferred platform to retrieve this info (desktop computer, PDA, cell phone, phone w/speech, kiosk at the bus stop, printout)?
- j) Are you a student? What year are you in?
- k) Do you have a car?
- l) If this system were available how often would you use it?
- m) What information would you need to use the public transport efficiently?
- n) If the system were available would you use the public transit more often? Why?

A.2 Results Summary

Of the ten people who were surveyed, eight were undergraduate students at the University of Guelph. The other two were a middle-aged professional and a high school student. University of Guelph students are the most frequent users of the Guelph transit system so this sample distribution is appropriate.

It was found that a large number of respondents surveyed used the bus frequently. Many cited that they had problems figuring out the bus system and often had to ask bus drivers for

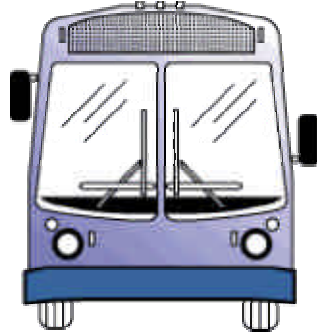
directions. A number of them expressed their frustration of receiving inaccurate and/or incomplete information when they asked for scheduling information for the buses.

With the exception of two respondents, all were very interested in an interactive system where they could input their destination and get precise directions on what bus to take. The two other respondents liked the idea of a simple printed schedule instead, but they did complain that no such schedule is currently available in the city. All agreed that something needed to improve the current system, as it was very difficult to get scheduling information without the aid of a bus driver.

Regarding the delivery platform, there was almost universal agreement that a web-based interface would be very useful. The idea of using kiosks, conveniently located at bus stops, was also highly favoured. Most respondents shunned the idea of using a cell phone to access the system, but one person thought it would be a great idea.

When asked if they would use a system like *iTakeTheBus*, there was universal agreement that such a system, if in place, would be very useful. Many expressed their frustration with the transit system because it could be so confusing at times. All respondents said they would use the transit system more often if the *iTakeTheBus* system were installed.

CIS*4300 User Needs



iTakeTheBus

A system for delivering concise and accurate transit information on demand.

October 27, 2002

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Executive Summary:

The iTakeTheBus system is an interactive product, which will provide the scheduling information for the public transport in Guelph. The system will also offer access information for the main points of interests in the City.

This report presents the results of the analysis of user needs as they relate to the iTakeTheBus system. The main goals of the system are to make the public transport easier to use for both the residents and the tourists and to increase the accessibility and exposure of the City destinations, e.g., the cultural points or businesses. In order to clarify the current transportation situation and the proposed solutions, the report lists the use scenarios and provides hierarchical analysis of the main user tasks. In addition to the users' interviews, several existing information systems in transportation and tourism have been reviewed to provide input into the requirements and the design stage. A detailed analysis is presented for the Prague Public Transit system, which features several options desirable in the proposed iTakeTheBus system.

The usability requirements are the key system requirements and include efficient and effective interface. Furthermore, the system shall be available as both a web application accessible through a web browser and a touch-screen kiosk located at a bus stop, be durable, and provide scheduling information to destinations of various kind, e.g., cultural points or businesses.

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1. Use Scenarios

Based on survey data collected, two potential user scenarios were synthesized. These scenarios encompass the rider's basic interactions with the city's transit system. The two scenarios are as follows:

1.1 Choosing a bus route to the selected destination

"I just moved to Guelph at the beginning of the semester. I live near the Stone Road Mall and wish to take the bus to the Willow West Mall to buy something I could not find here. I go to the bus stop behind the mall; there may be another bus stop closer to my house I do not know. It is raining and the bus stop is deserted. There is no route plan but I know the bus downtown should come every half an hour. I am not sure whether going downtown is the best option but I know that most buses go downtown so it is the safest option. "

"When the bus arrives I confirm the bus is going downtown with the driver and take the ride downtown. Before leaving the bus I ask the driver which bus I should take next and where the bus I am supposed to take actually waits. The driver is very helpful. I get on the second bus, go to the Mall, and then take the same two buses back. "

"I have accomplished what I wanted to do but there may have been a better and faster route. Next time, I will have to check the on-line maps – the Guelph Transit System has detailed PDF maps on line. I wish they had some on-line route planning system where I could enter my location and the desired destination and select the optimal route. "

1.2 Planning a sight-seeing or shopping trip through the city

"I call the bus station and ask them, where I can get the bus route map. I buy the map, sit down, and select the routes close to the points of interest I would like to see. I then call the bus station again and ask for arrival times to certain location. I write all information down, and verify the route I have pre-selected would match. I select a few alternatives, and start my trip. "

2. Goals

The iTakeTheBus system aims to accomplish two main goals for the city of Guelph and its transit system. These goals are as follows:

2.1 Make public transit easier for individuals to use

Deciding on which bus, subway, or streetcar to take can be a time-consuming task for even the seasoned rider. In the past there were hard-to-read printed schedules and complicated maps to make this task easier, but they often meant unsatisfactory experience for the rider, and may have also alienated many possible users of the system [1]. The goal of the iTakeTheBus system is to make the transit system easy to use by providing a simple and straight-forward access to bus routing/scheduling information. Accessed

via conveniently located touch-screen-driven kiosks at major bus stops, or via the web from home, the system will greatly increase the ease, with which the riders can find out how to use the bus system.

2.2 Increase exposure and accessibility to the city.

One of the major problems facing the tourists is the inner-city transportation. Public transit systems can often be quite complicated which can easily confuse and frustrate tourists [2]. For this reason, many tourists will avoid potential destinations as it is simply too hard to get there or they do not want to deal with the hassle of renting, and ultimately finding parking for, a rental vehicle. However a well-designed transit system coupled with good directions can significantly increase the appeal of the city [3]. Making it easier for tourists to travel inside of Guelph is a major goal of iTakeTheBus.

A secondary part of this goal is providing easier access to tourist information, e.g., attractions, to travellers. Having immediately accessible information on attractions, via a system such as the iTakeTheBus system, will greatly increase the attractiveness of Guelph from the tourist point of view.

3. Hierarchical Task Analysis

3.1 Task #1: Select a route from the starting point to the destination

1. Get starting point
 - a. Enter the starting point/address
 - i. Current location
 - ii. General location
 - b. Read alternatives if more than one solution to the entered address
 - i. In text form: as a list of choices
 - ii. In graphical form: as a location on a map
 - c. Confirm the desired starting point
2. Get destination
 - a. Enter the destination address
 - b. Read alternatives if more than one solution to the entered address
 - i. In text form: as a list of choices
 - ii. In graphical form: as a location on a map
 - c. Confirm the desired destination
3. Choose route to destination
 - a. Read possible alternative routes
 - i. In text form: as a list of choices
 - ii. In graphical form: as a route on a map
 - b. Select the route
 - i. According to the timeframe
 - ii. According to the geographical location of the route
4. Choose the type of the output
 - a. Display
 - i. Format / level of detail
 - b. Printed copy
 - i. Format / level of detail
 - c. Email
 - i. Destination
 1. To the user

2. To somebody else
- ii. Format
 1. Desktop
 2. Portable device/ cell phone

3.2 Task #2: Find a route from starting point to various attractions

1. Get starting point
 - a. Enter the starting point/address
 - i. Current location
 - ii. General location
 - b. Read alternatives if more than one solution to the entered address
 - i. In text form: as a list of choices
 - ii. In graphical form: as a location on a map
 - c. Confirm the desired starting point
2. Get list of attractions
 - a. Select categories of interest to narrow list
 - i. List all attractions
 - ii. List by activity type: Dining, Show, Music, Museum, Arts, Sports
 - iii. List by availability
 - b. Select various attractions desired
 - c. Confirm the list of attractions
3. Get route
 - a. List possible route
 - i. Textual list
 - ii. Graphical route on a map
 - b. Refine route by adding/removing attractions
 - i. Add attraction
 - ii. Remove attractions
 - c. Refine route by changing order of attractions
 - d. Show updated/final route
4. Choose the type of the output
 - a. Display
 - i. Format / level of detail
 - b. Printed copy
 - i. Format / level of detail
 - c. Email
 - i. Destination
 1. To the user
 2. To somebody else
 - ii. Format
 1. Desktop
 2. Portable device/ cell phone

4. Evaluation of an existing system

4.1 Transportation Systems Overview

Initially, a general study of information systems used in transportation was conducted. The study focused on so called Intelligent Transportation Systems (ITS); systems that “make the movement of people more economical and, therefore, more intelligent” [4]. A thorough ITS listing is available at the ERTICO website [5]. The systems reviewed at the Ertico web site include various traffic navigation systems and most of all multiple passenger information and route searching systems dedicated to promoting public transportation, e.g., TripPlanner in the UK, SIT in Spain, or Info-bus in Geneva. The success stories of these systems served as the initial input into the design of the iTakeTheBus.

4.1.1 Public Transportation Systems in selected Canadian cities

In order to locate and evaluate an existing system in a Canadian community, the online information for several major cities was searched. The search focused on the public transportation and tourism websites and links. The search results are listed below:

- a) Toronto, Toronto Transit Commission <http://www.city.toronto.on.ca/ttc/>, provides route maps and listing of the schedules. No interactive route finder available.
- b) Kitchener/Waterloo/Cambridge, Grand River Transit located at <http://www.region.waterloo.on.ca/web/transit.nsf/form?openform> provides a listing of bus routes and schedules. Schedules are available in PDF format only. There are no interactive components on the Grand River Transit site.
- c) Calgary, Calgary Transit <http://www.calgarytransit.com/> offers services the basic route map and schedule listing information. Calgary Transit offers two ways to retrieve timetables. One is the traditional table format and the other is an interactive component. The interactive component is limited to finding bus arrival times from within one route only.
- d) Vancouver, Translink <http://www.translink.bc.ca> offers a more sophisticated interactive web-based solution to retrieving transit information. Trip planning, scheduling information and maps are readily available. The trip planner integrates the use of maps with origin and destination points labeled.

4.1.2 Popular transportation planning systems

A variety of solutions for finding an optimized driving route is available, for example, Maptuit FleetNav [6], Yahoo! Maps [7], and MapQuest [8]. Although these applications do not provide scheduling information for public transport, elements of their user interface to mapping tools provided input into the prototype design of the iTakeTheBus.

4.2 Prague Public Transit System

Next, the Prague Public Transit (PPT) system was selected for the review. The PPT system provides scheduling and routing information for Prague, the capital of the Czech Republic [9]. The PPT is heavily used by both the local residents including the students of numerous universities and the tourists.

4.2.1 Highlights of the system

The PPT system is a part of a universal system providing travel information for busses and trains in the entire country and including connections to other European countries. The route can be specified by starting and ending point and optionally also by an intermediate stop. The user can specify the departure time or the preferred arrival time. The system accepts any geographical description including public transit stops, railway and bus station, theatres, cinemas, libraries, hospitals, shops, camp sites, police stations, universities, hotels, monuments, pharmacies, etc. The user interface is available in three languages: Czech, English, and German. The language version can be switched at any time without restarting the application or re-entering the data.

4.2.2 Typical use scenario

The user enters the starting point, destination, and time of the departure or arrival (Fig 1). Optionally, the user can specify also a preference for a tram, bus, subway, or a bus for handicapped people as well as intermediate stops. The system then returns the closest public transport stops. The user selects the most convenient location and confirms the choice. The system displays the timetable and the length of the corresponding route (Fig 2).

4.2.3 Additional features

- a) Lookup and listing of the tram and bus routes by stops and times.
- b) Address listing of the points of interests, e.g., hospitals, entertainment, shopping, government.
- c) Trip options - sightseeing and round trips with the public transport.
- d) Timetables of public transport in other cities, intercity timetables, Europe train system.
- e) Links to the websites of other transport companies and organizations in the country and in Europe.
- f) The timetable can be formatted for printing and also sent out as an email message.

4.2.4 Miscellaneous

Number of stops recognized: 2183

Number of routes: 53667 (the same geographical routes starting at different times counted individually).

Accuracy: the database is updated daily.

4.2.5 Recommended extensions, confusing parts

The following functionality was found confusing or missing:

- a) The Preferences part is confusing.
- b) No documentation available.
- c) Some pushbutton labels are not descriptive, e.g., ">>Less<<" , "<<More>>" denotes a brief or extended display of options but may not be intuitive to some users.
- d) In order to provide visual cues of the geographical location of a bus stop or route, the selected routes could be overlapped on the city map.
- e) Similarly to d), the destinations could be selected visually on the map in addition to the textual definition.

Figure 1: Specifying the starting point, destination, and time.

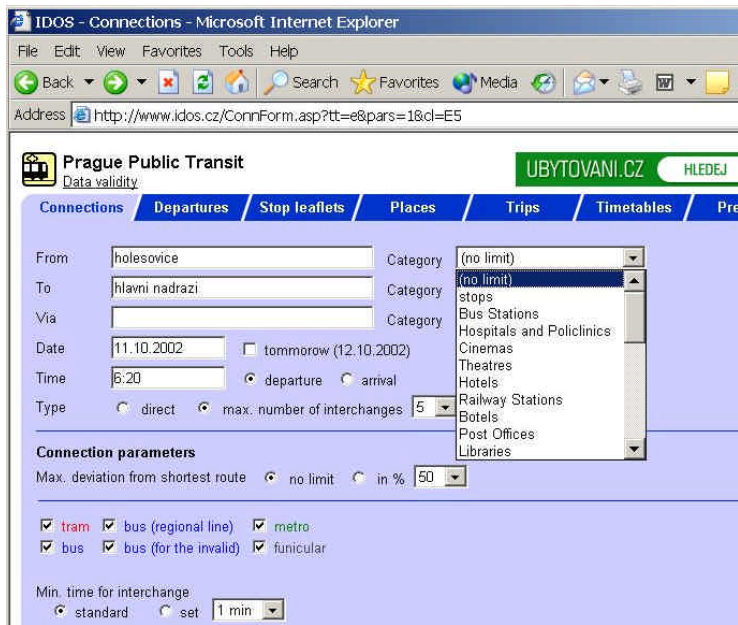
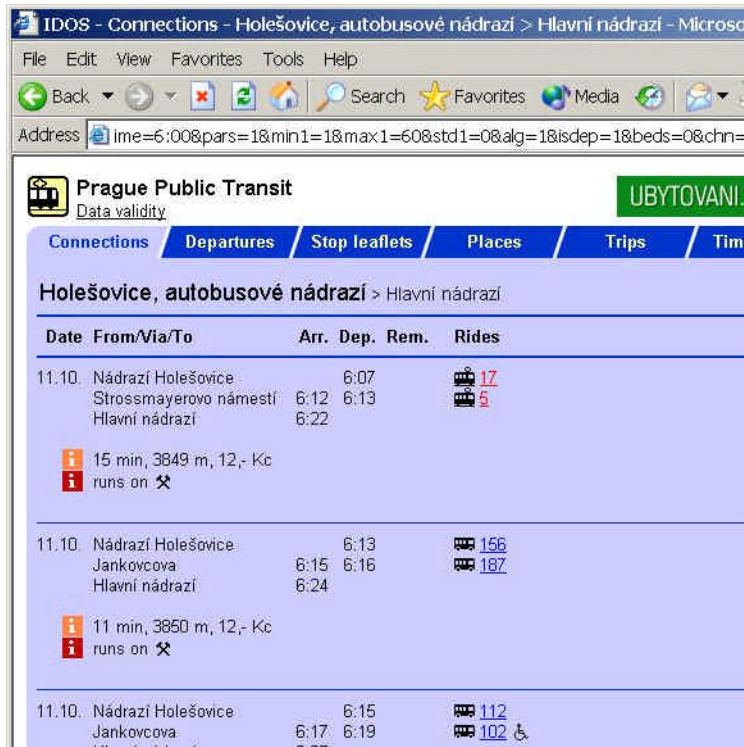


Figure 2: Timetable returned by the system



5. Requirements for the *iTakeTheBus* system

The key requirements of the *iTakeTheBus* have been categorized as either functional or a non-functional and are listed below.

5.1 Non-Functional Requirements:

5.1.1 The system shall be accessible via the internet as well as at kiosks located at selected bus terminals.

To ensure the transit information is readily available to everyone we have deployed a kiosk as well as a web-based application for citizens to use.

5.1.2 It must be easy to use by everyone.

The kiosk and web-based solutions must be cleanly presented to the user. The steps involved in obtaining directions via *iTakeTheBus* must be logical and intuitive. Too many required steps can hinder the user's experience. The user may become anxious, bored, confused or frustrated with the system if it is continually prompted for information. The interface must be universally understood. The use of universal symbols can help this along. Since the target of the system is the general public a grade school education is the minimum educational requirement placed on this system.

5.1.3 The information must be clear, concise and accurate.

The information on the screen or printout's must be easily read at glance. The print should be of a reasonable size and font to ensure this requirement is met. The information (data) in the system should be kept current with any changes to the transit routing and times.

5.1.4 The user shall be able to obtain the required information fast.

The system's interface shall allow a very efficient interaction with the user. The users will be often in a hurry and excessive amount of required input would result in abandonment of the system.

5.1.5 The kiosk implementation of *iTakeTheBus* shall be vandal resistant.

Public computer terminals often become a target of vandalism. The system is to be implemented both as a web application and a kiosk, and the kiosk version shall be therefore designed as durable as possible.

5.1.6 System Status shall be apparent.

The status of the system must be evident at all times. Failure to provide this feature may result in frustrated, anxious or bored users. The system must make it clear to users what it is doing. Keeping the user informed is a key ingredient in a good user experience.

5.1.7 The system shall recover from and/or prevent errors.

Whenever possible, the system will attempt to prevent the error. If an error does occur, *iTakeTheBus* will handle the error appropriately and, as mentioned above will report the necessary information to the user.

5.1.8 Online Help shall be available for the iTakeTheBus Web Interface.

A help system can accommodate those users who use the web interface. An equivalent help system is not feasible in the kiosk implementation given the screen size constraint. The kiosk interface shall be, therefore, designed with a high affordance. Hard-copy documentation is not required for this system as the travelers would not use it given the outdoor location of the system. Only a review of specifications will accompany the system for evaluation purposes.

5.2 Functional Requirements:

5.2.1 Provide the most probable alternative origins and destinations for the user.

In case the user's input does not generate direct matches the system will return the most probable alternatives for the user to select.

5.2.2 A mapping feature shall be deployed to accompany the textual listings.

Potential routes will be labeled from origin to destination on a map to give the user a visual overview of their trip and accompany the textual listings of the routes.

5.2.3 The scheduling information shall be available in printed form along with screen output.

The kiosks will be equipped with a printer as a means of outputting scheduling information. The other alternative is to read the outputted information from the kiosk's screen.

5.2.4 Back and Forward navigation will be employed for the traversal of the system.

Both the kiosk and web-interface will possess back and forward navigation features regardless of their current system state.

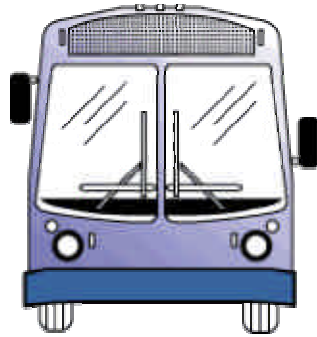
5.2.5 The system shall provide traveling and tourist information.

The system shall cover both the public transport scheduling and routing information and also provide accurate tourist information on the cultural, entertainment, business, and municipal destinations registered with the system.

6. References

- [1] *Public Transit Pictograms*. Canadian General Standards Body. website.
http://www.pwgsc.gc.ca/cgsb/calibre/winter99/english/public_news-e.html Accessed October 22, 2002.
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- [6] Maptuit Corporation, <http://www.maptuit.com>
- [7] Yahoo! Maps <http://maps.yahoo.com/>
- [8] MapQuest <http://www.mapquest.com/>
- [9] Prague Public Transport system: <http://www.idos.cz/ConnForm.asp?tt=e&cl=E5>

CIS*4300 Pro totype



iTakeTheBus

A system for delivering concise and accurate transit information on demand.

November 14, 2002

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Executive Summary

The iTakeTheBus system is an interactive product, which will provide the scheduling information for the public transport in Guelph. The system will also offer access information for the main points of interests in the City.

The iTakeTheBus system will be accessible via two main interfaces: kiosk and a web browser. The kiosk interface was prototyped first because it is more challenging relative to a traditional web application and, therefore, carries more design risk. The two prototypes of the kiosk interface were constructed and tested in a series of interviews. The end users appreciated the simplicity of the design, option of arrival times, and visual tools including a scrollable map.

1. Introduction

The iTakeTheBus system is an application, which will provide the scheduling information for the public transport in Guelph. The project proposal and the requirement analysis are described in the earlier reports [1, 2]. This document describes the design, implementation, and the analysis of the prototype.

2. Prototype Design and Implementation

Two prototypes of the kiosk interface were constructed, one in PowerPoint and another in HTML with PHP server scripts. The main conceptual model of both prototypes is the same. They differ in implementation of particular features like entry of the destination, route visualization, and screen layout.

2.1 Conceptual model

The main conceptual model is shown in Figure 1. The specific handling of the destination entry as implemented by the PowerPoint prototype is in Figure 2.

Figure 1: High level flow chart for the iTakeTheBus system

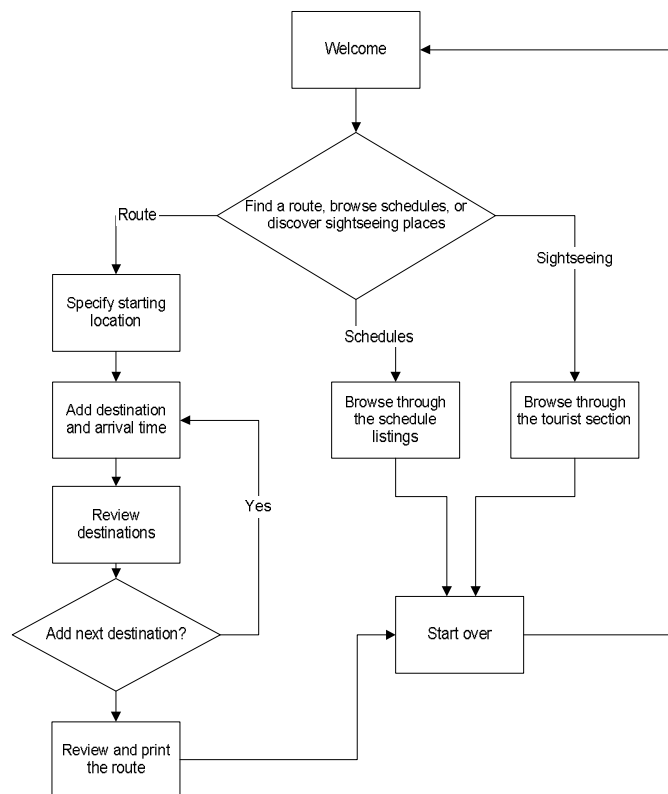
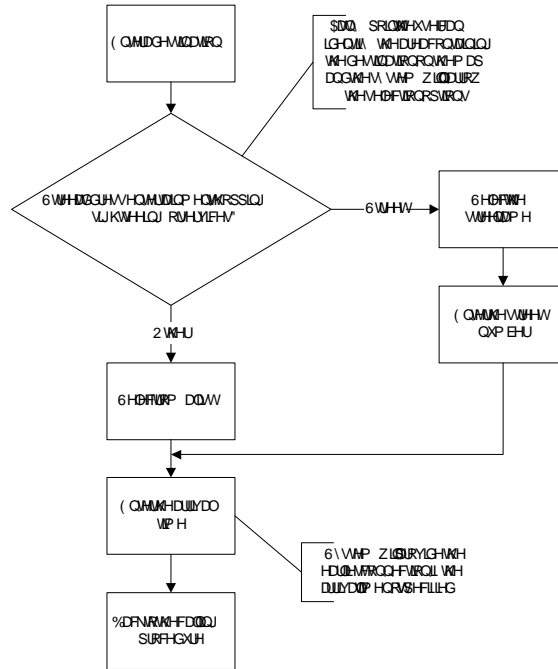


Figure 2: Flow diagram of the destination selection process.



2.2 Navigation and screen shots for the PowerPoint prototype

The intended path through the PowerPoint prototype is below. Please, see the Appendix A for detailed screen shots of each slide.

Fig. A.1: The user presses the "Find a route" button. The other two buttons are currently not linked to any slide.

Fig. A2: The user either confirms the current location or specifies a different starting point, e.g., when planning a route from his/her house.

Fig. A3 and A4: If a different than the current location is specified then the user has the option of selecting the location on the map or from the predefined categories. The map will repeatedly zoom-in the touched section of the City (not functional in the prototype).

Fig. A5: If the category input is selected then the user can choose the destination from a list (the list box and scroll buttons are not functional).

Fig. A6: If the Street address input is selected then the user can choose the street from a list and type the optional street number (the list box, push and scroll buttons are not functional).

Fig. A7: The user enters the preferred arrival time (buttons not functional).

Fig. A8 and A9: The user verifies the list of destinations, edits or deletes a destination. If the user decides to add the next destination then he/she is taken through the slides A3 to A7.

Fig. A10 and 11: The schedule is displayed either in a summary view or a detailed view with intermittent stops.

Fig. 12: The bus route can be also overlapped on the City map.

2.3 Design history

The user interface design started already in the proposal stage and continued through the requirements analysis. In the prototype stage, a high-level conceptual model was formalized (Figure 1) and the prototype screens were sketched. They were then implemented in two versions: PowerPoint and HTML.

3. Prototype Testing

This section discusses the process of testing and refining the prototypes mentioned in the previous section.

3.1 Interviews

Outlined below is the methodology behind the interview process, the data generated from the interviews and finally the analysis of the data.

3.1.1 Methodology

A total of 4 semi-structured interviews took place after the development of the initial prototypes. Each candidate viewed the html prototype followed by the Power Point prototype. Each candidate was given only a few instructions on how to use the system prior to the demonstration. The idea was to test whether or not the prototypes were self-guided. Candidates were informed that these are only prototypes and thus are not fully functional. Some guidance was provided in this case, but generally no other instruction was given on how to use the system.

Throughout each demonstration the candidate was asked to express any likes or dislikes about the system in relation to button size, colours used, position of items etc. The questions “why?” was used consistently as a follow up question to spark a deeper discussion. The standard questions asked were:

- 1) Did you prefer to type in the address and select a street from the list OR did you prefer to click on a location on the map?
- 2) Would you prefer to see your results printed in a tabular format OR drawn on the map for you?
- 3) Were there anymore categories you thought that might be useful to include?
- 4) Were the colours contrasting enough to make everything clearly visible? What would you change?
- 4a) What about button positioning?
- 5) Were the steps you used to interact with the prototype logical and intuitive?
- 6) Would you prefer a hardcopy or the results OR simply to view them on the screen?
- 7) Was anything about either prototype unclear?
- 8) What could be done to improve it?

3.1.2 Data

One of the shortfalls of creating a list of questions and then proceeding with the interviews is that the questions may not lead to the feedback expected. The advantage of holding semi-structured interviews becomes increasingly important in that additional questions can be easily posed to each candidate. The following is a compilation of the data generated from the interviews.

HTML Prototype:

Candidate A:

- ? I like the layout of the letters. It may not be representative of a keyboard but at least everyone can understand where the letters are if they are in alphabetic order.
- ? I would like to have route information displayed to tell me where to catch what bus and when. The map doesn't really help me.

Candidate B:

- ? The keyboard layout does not have a space button
- ? It is difficult to tell which item of the several dropdown menus is selected/inputted when I click done?
- ? I had difficulty noticing the page transitions. I could tell something changed but I was not sure of what.
- ? I understand the button configuration but would prefer a "diamond" configuration.
- ? I found that the instructions were too wordy. I don't like to read a lot to figure out what to do.

Candidate C:

- ? I like the sentence format on the buttons, but take out the word "now"
- ? There is no space bar enter address page
- ? After clicking on DONE the data disappears. Why?
- ? I would like to have textual routing information as well as the map.
 - o I like the visual map feel, but the route info is more useful to me.
- ? What is the difference b/w a yellow button and a green button?
 - o Why is the "I have no further destinations" button green?
- ? It would be nice if the keypad of letters was in the shape of a keyboard
- ? It would be nice if in addition to back/forward there was a "home" button
- ? I would like an alphabetic "jump to" feature in addition to the categorized lists
- ? Some buttons I found were too close together to touch. (mouse click on)

Candidate D:

- ? I understand the basic procedure and can navigate around ok.
- ? I don't like the fact that I have to go through several pages to select multiple destinations. I would rather enter them all in from one page.
- ? Overall I found it a little complex
 - o I really had to focus on what I was doing to use the system.
 - o Maybe less wordy buttons would help

Power Point Prototype:

Candidate A:

- ? I found this system to be more confusing. I would like more of a description like the other prototype had.
- ? The overall concept is clear

- ? I would definitely use a system like this.
- ? I like the table of route information that is displayed.

Candidate B:

- ? First words: "I like it a lot!", "ooh wow, it is so simple". Very simplistic
- ? Not too wordy yet it is still clear what is to be done
- ? I was a bit confused about "other locations" I would drop the "s" and just have it say "other location"
- ? I like the arrival time idea. "It makes it more idiot proof!"
- ? Could you put a dot on the map where each bus route is?

Candidate C:

- ? I really think the "jump to" feature is handy
- ? I like picking the street name from the list as apposed to typing it in.
- ? "The print feature is great!"
- ? I also like the "start over" button. This is a really handy way of getting back to square one.
- ? The add/delete destinations is a good feature. It is also setup intuitively.

Candidate D: (Interviewed with version 2.0)

- ? I like it a lot. It is simple, with easy buttons to push.
- ? Has a really clean cut look. Very clear
- ? I think the Detailed View is a great idea
- ? Overall this one I think was better.
- ? Very clear. I would definitely use a system like this.

3.1.3 Analysis

All candidates agreed that this type of system would be a great asset to the City of Guelph as well as to other cities. They all confirmed that it would definitely simplify their lives slightly.

Most candidates preferred the PowerPoint prototype over the HTML version because of its clear, simplistic, clean cut appearance. Candidate A said with an excited tone, "Ooh wow, it is so simple." This prototype provides short, yet informative descriptions for users to guide them through the process of finding a particular route to a destination. All candidates commented on the ease at which buttons could be hit as well as how easily the large text could be read.

Candidate A did however indicate that she preferred the more descriptive tone that the HTML prototype carried. She felt that the descriptions helped her while other candidates did not want to bother reading large amounts of text. They felt it cluttered the screen and detracted from the overall appearance of the prototype.

Overall the logical flow of the both prototypes was well received by all candidates. It is clearly evident though that the PowerPoint prototype was preferable over the HTML prototype therefore, the second iteration only deals with the PowerPoint prototype.

3.2 Iterations

After Candidates A, B and C were interviewed another candidate was interviewed with the PowerPoint prototype (version 1) and the original HTML version. The following is a list of modifications from version 1.0 to version 2.0

3.2.1 Modifications of PowerPoint Presentation – Version 1.0 to 2.0

The following changes were made to reflect the candidate's feedback and ideas about the PowerPoint prototype.

- ? Modified slide 18 to include a Summary View as well as a Detailed View of the routing information. The detailed view now shows minor bus stops along the route to the destinations and their respective arrival times.
- ? Added more map controls including navigation arrows and a zoom in and out tool
- ? Minor changes include:
 - o Delete button changed to red
 - o Wording of slides 17 and 2 were changed to increase clarity
 - o Several buttons were re-positioned

3.2.2 Further Iteration

Candidate D was interviewed while using the PowerPoint prototype (version 2.0) as well as the original HTML version.

The new detailed view and Summary view were very well received by this candidate. Very similar feedback to the other candidates was generated from this interview. The red delete button was too loud, giving it too much emphasis. It has been changed back to its original blue colour.

4. Summary

The implementation of the user interface is an involved process. Both the PowerPoint and HTML prototypes were initially created keeping the users needs in mind. Furthermore, we iterated over the prototype receiving user feedback at each stage. After the first iteration, the analysis of the data revealed that the PowerPoint prototype was preferable over the HTML prototype.

5. References

[1] J. Kominar, G. Nasby, Z. Nejedly, S. Vance: *CIS*4300 Proposal: iTakeTheBus*, Report for the HCI course, University of Guelph, October 2002

[2] J. Kominar, G. Nasby, Z. Nejedly, S. Vance: *CIS*4300 User Needs: iTakeTheBus*, Report for the HCI course, University of Guelph, October 2002

Appendix A: Screen shots for the PowerPoint prototype

Figure A.1: Welcome screen

Figure A.2: Entry of the starting location

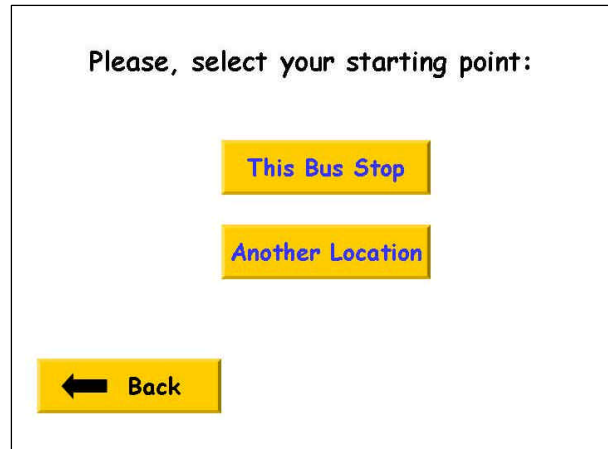
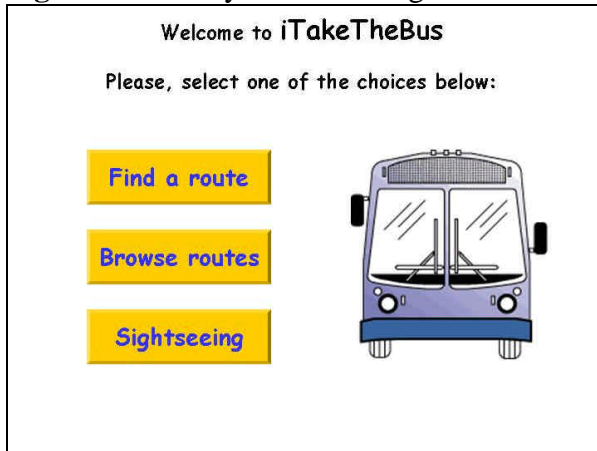


Figure A.3/4: Specification of the destination or the start (if different than the current location)

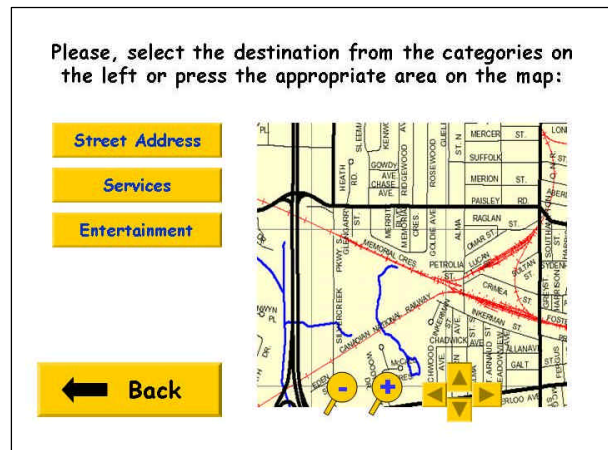
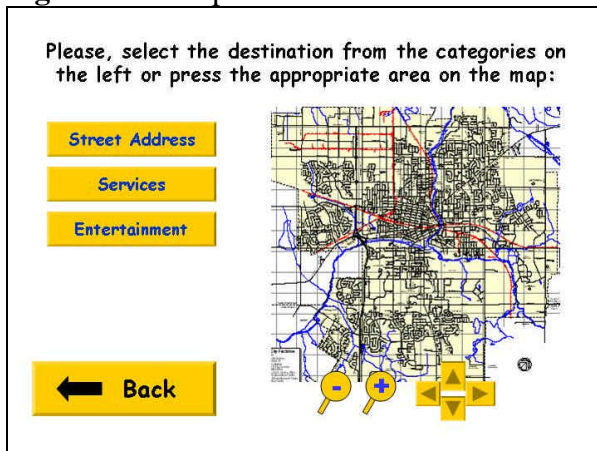


Figure A.5/6: Selection of the location from categories or by entry of the street name and No.

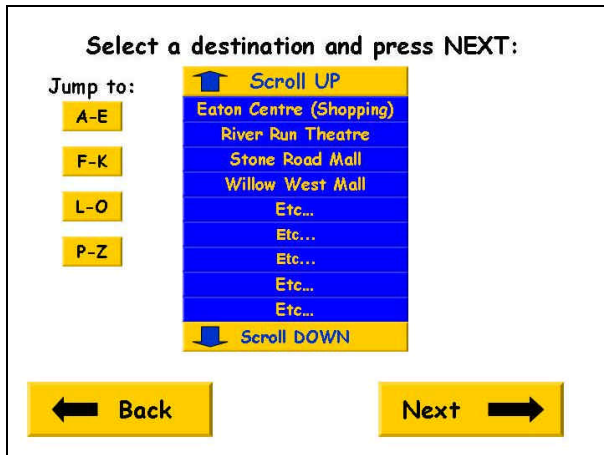


Fig. A.7: Entry of the arrival time.

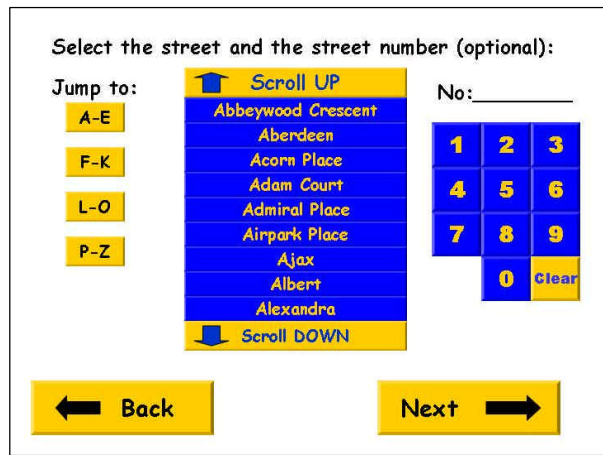


Fig. A.8: Review of the destinations

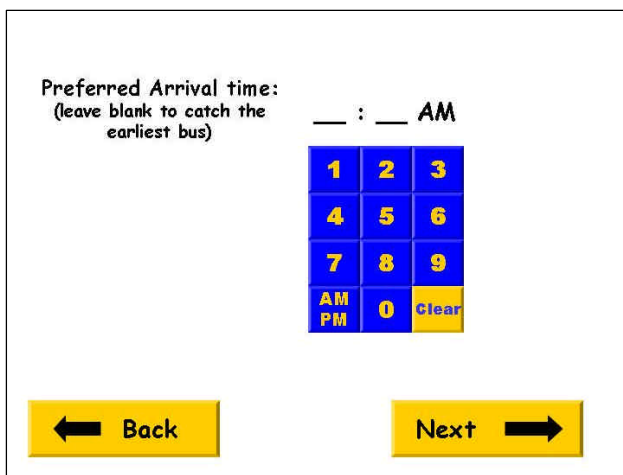


Fig. A.9: Review screen after the addition of several destinations.

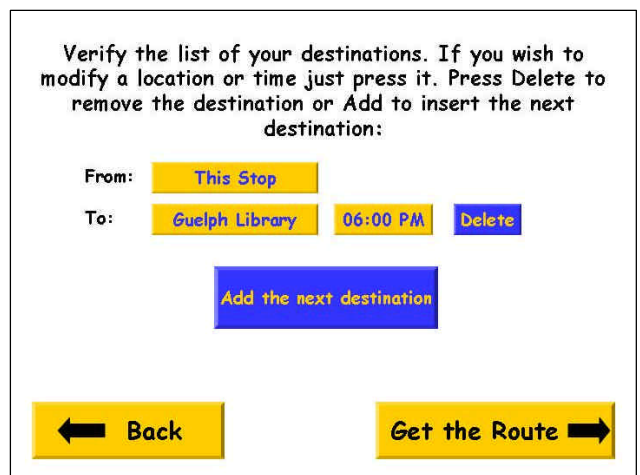


Fig. A.10: A detailed view of the timetable

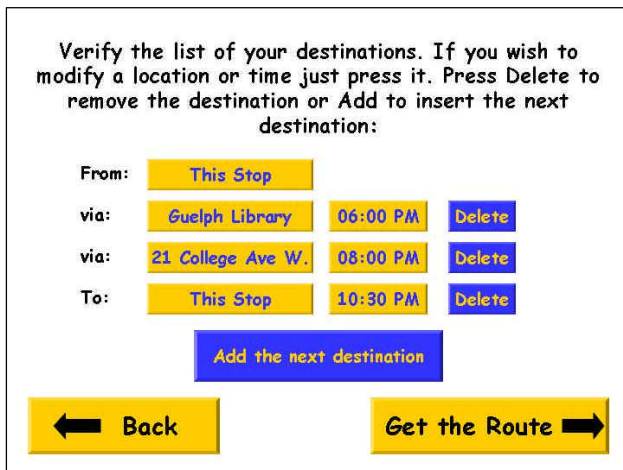


Fig. A.11: A brief view of the timetable.

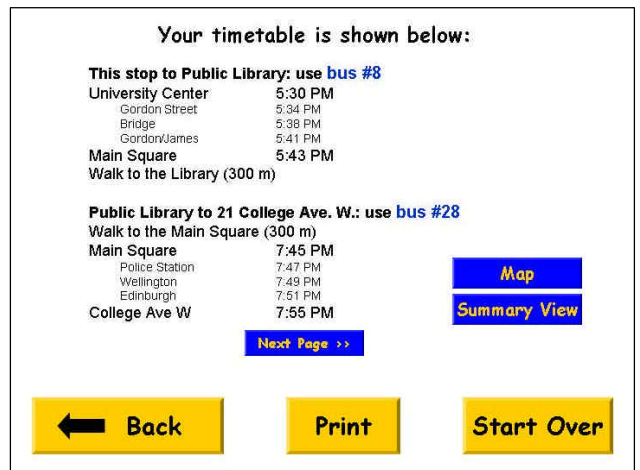
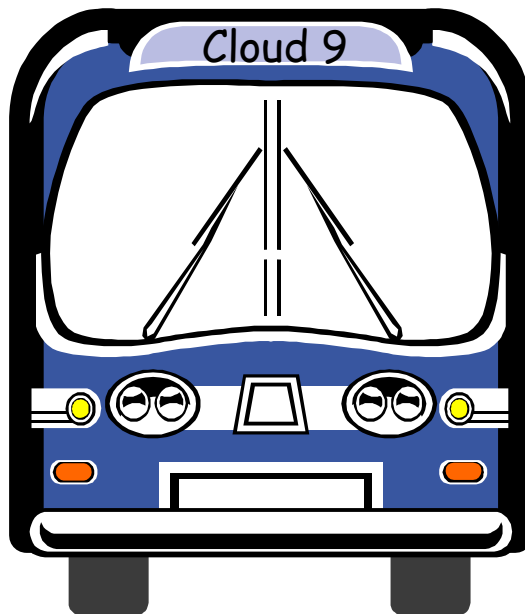


Fig. A.12: Route map.

CIS*4300 Discussion



iTakeTheBus

A system for delivering concise and accurate transit information on demand.

November 22, 2002

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Executive Summary

This document reflects on the process of designing of the *iTakeTheBus* - the public transport information system. It discusses the achievements and setbacks of the projects as well as suggests what can be done next.

The creators of the *iTakeTheBus* consider the main concept of providing the transportation information on demand along with the prototyped user interface to be the main achievements. This was a result of appropriately selected and timely executed methods like task analysis, top-down design of the prototype, inclusion of the user feedback, and the iterative lifecycle. The interviews provided wealth of information but, unfortunately, turned out to be time consuming and were performed only on a small group of end-users. Both the prototype evaluations and the stakeholder interviews should be, therefore, expanded. Similarly, a review of additional existing systems would help to design the system so that it can be connected, for example, to inter-city information systems. The further development of the system is to include design of the web interface along with the design and implementation of the system itself.

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3. USER INVOLVEMENT	5
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4.3 DESIGN AND IMPLEMENTATION OF THE SYSTEM	6

1. Introduction

The *iTakeTheBus* system has undergone many stages of development since its inception. Much positive feedback was obtained as a result of the iterative development process involving the users of the system. The following sections outline strengths, setbacks, and reflections on the project experienced by the *Cloud 9* team members.

2. Strengths and Weaknesses

2.1 Achievements

The *Cloud 9* is particular proud of the implementation of the idea of providing route information on demand via kiosk and web-interface, which was well received by the stakeholders of the system. Furthermore, *Cloud 9* is also proud of the final version of the user interface prototype and the interviewing process and analysis we have conducted to reach the end product.

2.2 Strengths

The collaborative effort of all group members has led to well defined user needs, from which several key tasks were developed. The process of analyzing the tasks was done with great care and ultimately helped shape the resulting prototype.

Cloud 9 is pleased with the research of similar existing systems. Since the goal of the project was to create a new and useful tool to simplify student life we found it important to explore existing systems. The team took the time to fully explore them because this knowledge was extremely valuable in developing a robust system.

Cloud 9 kept the main tasks in mind throughout the construction of the prototype. The goal was to make the user interface as simple and efficient as possible for all of our stakeholders. The result is a clean and straightforward prototype which is easy to use. The team is especially proud of the prototyping process. Initially two prototypes with the same set of goals in mind were built to generate more feedback during the interviews.

Improvements were made and the more popular prototype was iterated over once more. The interview feedback has played a significant role in shaping the final prototype.

2.3 Setbacks

The group members of *Cloud 9* encountered several delays along the way mostly due to lack of time. Interviews were especially time consuming to conduct. The amount of feedback was somewhat limited because the time constraints prevented us from running a higher number of interviews required for a detailed analysis. Additionally, there was a lack of diversity amongst our interview candidates. The main goal was to make student life easier and therefore students were interviewed throughout the design process. Other stakeholders, such as tourists, were not readily available.

2.4 Improvements

In an attempt to produce a solid prototype there are several key areas *Cloud 9* could improve if the project was repeated. One area includes a higher number of more detailed interviews with a wider selection of stakeholders. This point becomes particularly important during the process of refining and revising of both prototypes. Once several iterations have been completed a survey could have been done to determine, which prototype was more appealing and why.

Additionally, the idea of integrating the *iTakeTheBus* system with other mass transit systems as well as commercial services can be explored. Some cities offer “flex routes” for senior citizens. It may be useful for stakeholders to view these dynamic routes by means of the kiosk. There may be a potential for integration with commercial services such as travel agencies, shuttle services and airports.

3. User Involvement

The *iTakeTheBus* system has benefited greatly from the user’s feedback throughout the development cycle. The users confirmed the need for the *iTakeTheBus* system.

During the design stage they expressed a preference for a simple interface with minimal reading required. They acknowledged that the process of retrieving route information was logical and intuitive.

4. The Next Steps

4.1 Web Interface

The next immediate step would be the development of the user interface for the web client. The web interface was not included in the project up to this point because it carries relatively low risk. Instead, the kiosk touch-screen interface was developed and tested first as it required a novel approach very different from that required by the web design, which the *Cloud 9* members are familiar with.

The web interface would follow the same high level flow as the kiosk interface outlined in the Prototype Figure 1 but would use different data entry widgets, and include, for example, and extended mapping support and output to email.

4.2 Expanded Stakeholder Base

Analysis of stakeholders' needs and feedback is crucial for the success of the project and the user interview would be, therefore, extended to other stakeholders' groups including the transportation company or City of Guelph staff.

4.3 Design and implementation of the System

After the design of the user interface was stabilized, the next step would be the design and architecture of the system itself unless this was done already before or in parallel with the user interface design. Similarly to the UI design, this stage would follow the iterative lifecycle with prototypes, proofs of concepts, and user evaluation and finally conclude in the implementation stage.