

Final Report to the
UNIVERSITY OF PITTSBURGH
DISABILITY RESOURCES AND SERVICES
for the
2007 Online Accessibility Map Service Project

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ENGR 0715
Engineering Applications for Society
Spring 2007

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EXECUTIVE SUMMARY

The purpose of service learning projects in ENGR 0715: Engineering Applications for Society is to allow students to learn about the real-world applications of the engineering principles that are being taught in class through the use of a hands-on experience. For most students this course has been their first encounter with the types of professionalism, teamwork, and problem solving techniques required of engineers. Through the service learning experience, students were able to gain a greater appreciation for the necessity of these skills. Each group in the class teamed with a local organization in order to solve an engineering related problem. Over the course of the Spring 2007 term, this group worked with DRS to augment the online accessibility map and accessibility database presented by the 2006 groups.

This group consisted of three members: **Ryan D. Nath** is an industrial engineering student from the Pittsburgh area who is an avid Pittsburgh sports fan. When he isn't working his job at Wal-Mart, he enjoys playing pool, watching and playing basketball and football, and landscaping. **Mageena Q. O'Loughlin** is a bioengineering student from the Cleveland, Ohio area who is an avid *Cleveland* sports fan. Currently, she works in the University's Human Movement and Balance Lab and has recently become a member of the Freshman Engineering Leadership Team as an Engineering Ambassador. She aspires to work in Portland, Oregon designing running shoes at the Nike Sports Research Lab. **Timothy J. Parenti** is a chemical engineering student from the Erie area who is somewhat indifferent to the whole sports debate, having grown up living an equal distance from both Cleveland and Pittsburgh. He is very active in the University's band and choral programs, and intends to earn a minor in Music while here. He thoroughly enjoys web page design, singing, playing his trumpet, creating musical compositions for solo piano — and rooting for Pitt.

Originally, the scope of the project brought before the team included taking 13 measurements, making several observations, and taking pictures for each campus building not covered by the 2006 teams, and adding these buildings to the database presented last year. It also entailed compiling the pictures

and observations into the existing online interactive accessibility map, with the possibility of updating the format of the site.

Persistent wintry weather restricted the group's progress at many times, requiring the scope and timeline to be reassessed. These adjustments were discussed with DRS beforehand. **Deletions** from the building scope include:

- Ruskin Hall
- Forbes Craig Apartments
- Bouquet Gardens
- Biomedical Science Tower 3

Additions to the scope include aspects of increased professionalism in the final product, including:

- Reformatting of the database
- Enhanced interactive map interface, matching DRS website
- Increased “user-friendliness” and comprehensiveness of the website’s building pages
- Additional newer and clearer pictures taken for the website

Issues and concerns regarding the project include:

- Unrealistic expectations considering limited team size
- Not receiving measuring instruments in a timely manner
- Scheduling conflicts amongst team members
- Inclement weather, affecting both measurements and pictures

PROJECT DESCRIPTION

Various measurements were taken at the handicap-accessible entrances of all remaining University-owned buildings as well as Soldiers and Sailors Memorial (due to its frequent use by campus community members).

Length and height measurements were generally taken with one of two measuring tapes: a 25-foot tape marked to $1/32$ of one inch and a 100-foot tape marked to $1/100$ of a foot. The 25-foot tape was used for measurements such as door width, railing height, and the heights of power-assisted doors' buttons. The 100-foot tape was used for longer measurements such as ramp width, hypotenuse of ramp, and platform dimensions. Efforts were made to be consistent in the use of one measuring tape over the other for each type of measurement; where this was not possible, the data were converted into a consistent system of units.

Distance measurements such as distance of accessible path, distance from door to sidewalk, and distance from door to elevator were taken with a distance wheel which was capable of measuring distances up to 10,000 feet to the nearest one inch.

The measurements of **force** required to open each door were measured with a 50-Newton classroom lecture force gauge. The gauge was attached to the handle of the door, and pulled with continually increasing force until the moment when the door began to open.

The measurement and calculation of **ramp slopes** was done in two ways. One method involved the use of the 25-foot measuring tape and a laser level. One team member at the top of the ramp used the level to project a horizontal laser beam onto the measuring tape, which was being held vertically at the bottom of the ramp. The height at which the laser beam was projected onto the measuring tape gave the change in height from the bottom of the ramp to the level at which the laser beam was being projected. A quick compensation for the height differential between the laser beam and the top of the ramp was applied to each measurement.

Environmental constraints such as the presence of bushes, extremely lengthy ramps, curved ramps, and excessive ambient light disallowed the use of the first method. A second alternative method involving a string-line and level in combination with the 25-foot measuring tape was employed. In a fashion similar to the first method, one team member held the measuring tape vertically at the bottom of the ramp while another held the string-line taut at the top of the ramp. A third team member then used a

miniature level attached to the string-line to hold the string horizontally and thus obtain a value for the ramp's overall change in elevation.

An example of a case in which the second method was necessary was for measuring the ramps at the University Drive buildings of the Fraternity Housing Complex. The winding nature of the ramps made it impossible to take one measurement of elevation change for each ramp. As such, the process was generally broken down into multiple ramp "segments," and the respective elevation changes were added together to obtain a single overall elevation change, to allow for the reasonably accurate calculation of the ramp's slope.

In concurrence and in addition to the measurement aspects of the project, the group took pictures of these buildings and their entrances for use on the new online interactive accessibility map. The accessibility map was updated to include and support all buildings covered by the scope of the project, as well as Ruskin Hall, Forbes Craig Apartments, Biomedical Tower 3, and Bouquet Gardens, leaving only the University Club building not supported by the web site. The format of the interface was enhanced, matching that of the DRS main page, in order to better reflect the University of Pittsburgh's image. The site is now more comprehensive and user-friendly, while touting a more "professional" look and feel.

RECOMMENDATIONS FOR CONTINUATION OF PROJECT

While this team acknowledges that the project completed over last two years could be considered to be at a stable and satisfactory endpoint, there are still other possibilities allowing for a continuation of this work. Three such possibilities are outlined below:

ASSESSMENT OF FIRST-FLOOR RESTROOMS

A project involving the assessment of the accessibility of first-floor restroom facilities in each of approximately 64 buildings covered by the accessibility map. This was discussed at an earlier date with Lynnett van Slyke of DRS. The project would assess compliance with current regulations, with specific focus on Sections 4.16 through 4.27 of the Americans with Disabilities Act Accessibility Guidelines (ADAAG).

Estimates indicate that this project would either span two service learning courses (*i.e.*, spring terms) or involve two teams for one term. In order for measurements to be taken, each team **must** be composed of a **minimum** of two males and two females, and the teams should *emphatically* be requested to be comprised as such.

VERIFICATION OF EXISTING DATA

Another possible project would entail verifying measurements taken by the 2006 and 2007 groups, as well as filling in any missing data that the groups could not collect. This would also include development of a technique for direct measurement and calculation of the coefficients of static friction for each of approximately 36 ramps.

This team acknowledges possible constraints that could be imposed by the predominantly winter weather patterns of the spring term. As coefficients of friction are dependent on the two surfaces presents (*i.e.*, the ramp and the rubber wheel), any rain, snow, slush, or even salt can interfere with these measurements. However, this kind of interference may in fact be desirable so as to gain a truer understanding of the coefficients which the handicapped encounter on a daily basis.

This project could fairly easily be completed by one group with a **minimum of four** members in one term.

INTENSIVE ANALYSIS OF BUILDINGS OF CONCERN

A third possibility for continuation of the project entails an intensive analysis of campus buildings, taking extensive measurements of specific areas of highest concern. Based on these analyses and Computer Aided Design (CAD) renderings of the current situations, the group shall make recommendations for prospective changes as far as how accessibility could be improved, accompanied by appropriate CAD renderings and cost estimates with the ultimate goal of effectively conveying the need for accessibility modifications as well as the relative ease with which such changes can be made.

This group believes that this option would be the most beneficial to the students because of its direct applications to engineering principles as well as the service learning aspect of the course. It would also

be beneficial to DRS in ways similar to the 2006 and 2007 projects by providing additional quantitative knowledge about the current state of accessibility as well as possible remedies for the poorer situations. The University can also benefit from these by implementing recommendations made by the groups, thereby improving accessibility and avoiding the possibility of litigation regarding the least accessible buildings.

This team recommends a team of **at least four** members to be assigned to **no more than two** buildings for intensive analysis and recommendation. This team also recommends Bellefield Hall as the primary candidate building for assessment.

APPENDIX

Gantt Chart

ENGR 0715, Spring 2007, Team 1K (DRS) - Gantt Chart

