A JSON-BASED SELF-ADVISING SYSTEM*

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ABSTRACT

The process of planning a student's academic career is an essential component to ensuring an expedited completion of a college degree. Consequently the academic advising process plays a significant role in a student's academic life. The system introduced in this paper enables students to prepare properly for an advising appointment, giving them the possibility of maximizing its effectiveness. This stand-alone system is based on JSON to create a reusable and flexible one-stop solution to course planning. A preliminary study with IT students shows promising results.

INTRODUCTION

Academic advising is an essential and often overlooked component of the academic experience. Some universities dedicate staff entirely for advising, while others leave the job to professors. With the digitalization of nearly everything that society has been experiencing in the last few decades, this important student-advisor relationship may soon be automated.

The academic advising process is not just a task to endure every so often, but it is truly a lesson in life-planning in a somewhat rigid and regulated environment. It is essential that the students undergo a brief self-assessment of academic progress every so often to check their progress towards graduation. Receiving a pre-made schedule is not very formative, thus it goes against the core mission of any higher education institution.

This project's aim is to create a new, flexible tool that will help the students' awareness of their progress through the Applied Information Technology (AIT) degree at the University of Baltimore (UB). Consequently, students will have more tools and

certainty when planning for their remaining academic careers. We are also expecting the tool to stimulate students to meeting with their academic advisor more regularly through their studies.

BACKGROUND

Online and automated advising resources are copious and span over a range of automation that is significantly wide. Some projects involve a large amount of technology that integrates enterprise systems with artificial intelligence and decision-based systems to achieve a relatively autonomous process [1, 4, 5, 8, 14]. It seems like the student has minimal involvement with these systems, and simply receives an academic plan to be implemented.

The main question that arises when reading about such automation focuses on the direct effect that academic advising has on students. Removing such crucial interaction in favor of automated processes removes an essential element necessary for students to discuss scheduling concerns, career plans, and simple question-and-answer time with non-faculty members to name a few issues. It is actually advisable that in-person advising should be retained, keeping the technology component as an auxiliary toolset [13, 15]. The most effective advising practices include technology, a human advisor, and effective communications tools, such as e-mails and phone calls [7, 16, 18]. Solid academic advising programs help with student retention [2, 6, 9].

Other, earlier, projects feature less automation, thus requiring the active involvement of the students [10, 11]. Even though these systems feature a less intricate architecture, they still require a significant amount of technological involvement, which typically equates to application and database servers [3, 12]. The project described in this paper is largely based on these concepts, which attempt to offer support, and not replace the role of the advisor. It is essential to retain the traditional paradigm of communication between humans, preventing prescriptive advising sessions where an academic plan is simply delivered students.

THE SELF-ADVISING SYSTEM

The system is composed of three elements: 1) Course checklist, 2) Calendar worksheet, and 3) Course report. The checklist is the core feature introduced in this article, and is reported in Figure 1.

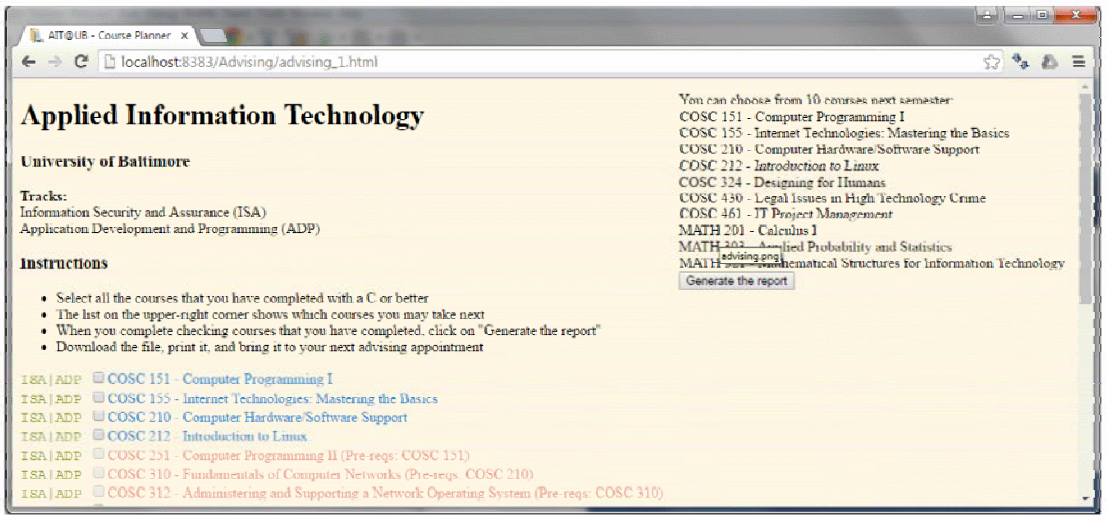

Figure 1 – The self-advising course checklist

Making students do some work is essential. The system should not just prepare a schedule spanning over four years, but the students should take a proactive approach towards making conscious decisions that will affect their lives in the short- and long-term. The system reported in Figure 1 allows the students to check which courses they have already completed. Once the student selects a course for which all the pre-requisites have been met (shown in blue, ex: COSC 151), the courses for which that particular course is a pre-requisite are then enabled for selection. A course is not available (shown in red, ex: COSC 251) unless all the pre-requisites have been completed. As the student selects which courses have been completed, the list on the upper-right corner is updated to show the courses they should take next. This system may be used in conjunction with other web-based services that the university offers, such as degree progress reports.

Students often do not perceive the process of earning a college degree as a project. Since this endeavor really is a project, we can utilize some tools from the domain of Project Management and apply them to this process. Perhaps the one tool that would be most effective is the GANTT chart [17]. The calendar feature will also include a Critical Path element to highlight which courses need to be completed as soon as possible, or will cause a delay for the expected graduation date. The planner would be available once the students complete the checklist, reported in Figure 1.

Once the students complete the worksheet, they can select the option to “Generate the Report”, available below the list in the upper-right corner. This will generate a PDF file that they can bring to their advisor to discuss their plans for the following semester. Once the calendar worksheet feature will be implemented, students will be able to generate a report that includes their entire academic career.

```
"program": {
      "university_name":"University of Baltimore",
      "university_abbreviation":"UB",
      "program_name":"Applied Information Technology",
      "program_abbreviation":"AIT",
      "program_tracks": [{
            "track_id":"adp",
            "track_name":"Application Development and Programming"
      }],
      "courses": [{
            "course_id":"cosc_490",
            "course_code":"COSC 490",
            "course_title":"Practicum in Information Technology",
            "course_description":"Provides students with hands-on work experience
                  in IT.",
            "offering":["spring","summer"],
            "corequisites": [{ "course_id":"cosc_470" }],
                  "prerequisites": [{ "course_id":"cosc_400" }, {
                  "course_id":"cosc_401" }],
            "prerequisite_rules": {
                  "description":"Three courses within your track.",
                  "rule":"3(cosc_300,cosc_301,cosc_402,cosc_403)"
            },
            "track": ["isa", "adp"]
            }]
      }
}
```

Figure 2 – Structure of the JSON file powering the course checklist

The core of this system is the JSON file; an abbreviated example is shown in Figure 2. This file allows the JavaScript to check for the correct pre-requisites, co-requisites, as well as give course information to the students. Currently there are two ways of showing pre-requisites. First, the file may just report a list within an array. The second method is through rules. For example in this case the course can be taken only after the majority of the upper-level major courses have been completed, per the prerequisite_rules field.

ADAPTABILITY AND WORKFLOW

Many of today's technologies are firmly oriented towards Services. For this reason, it is essential that a new system is adaptable to many circumstances, and as little technical requirements as possible. Previous solutions utilize either complex systems that require a significant infrastructure (AI-based advising) or at least a server on which a web application can run (XML-based systems).

One of the main goals of this system is its light-weight footprint as well as minimal system requirements. We already mentioned that many advising systems are quite

complex and require specialized software (such as application and database servers). This system utilizes only client-side technologies and a JSON file.

In order to extend this system to include a different academic program, all we have to do is prepare a new JSON file. This could be done very easily through a spreadsheet and a script. The academic advisor will fill out the spreadsheet with the pertinent information, and then a script can convert the file's content in the JSON format that powers this system. Any academic program may utilize this system, as long as they have one JSON file associated with each academic program.

This workflow can then be easily modified to create the JSON file manually, or to pull the information from a larger system. The course checklist itself can then be modified so that a department may feature all of its programs on a single page. All the students would have to do is identify their major, and the appropriate checklist will be loaded. This system will also work for academic programs where different years have different requirements, such as during the first few years after degree requirements have changed.

PRELIMINARY STUDY RESULTS AND DISCUSSION

As a preliminary study we created a short questionnaire asking the students about how they plan for courses, the role of advising personnel, and how likely they are to use this system. The questionnaire was given to the students in an upper-level programming course after they spent a few minutes with the system described here.

11 students participated to this preliminary study. Most students were at most one semester away from graduation, they were all seniors, and working on a degree in Applied Information Technology. When asked if they had developed a graduation plan, 8 reported that they had, while 3 reported that they had not. The graduation plan is a simple outline of which courses the students should take through their academic careers to ensure graduation.

The question that was most interesting for this study asked the students how likely are you to use this tool to plan for courses. This Likert scale question had answers that ranged from 1 for not likely at all to 5 for very likely. Out of the 11 students responding to the questionnaire, 3 students reported that they were likely to use this tool, and 8 reported they would very likely utilize it.

This small, preliminary study was very promising, and encouraged us to continue developing this system. Students in the Applied Information Technology program seem inclined to using this type of help while planning for their academic careers, and we expect students in other technology-related disciplines, such as Computer Science and Information Systems, to report a similar interest. We also expect students from other majors to react similarly, but we will conduct more testing as this tool is more mature and with a more appealing interface.

In a prescriptive advising setting, students simply see their advisor for a list of classes they can take or to have a form signed. Developmental advising involves conversations, educational goals, career goals, information about campus-clubs, tutoring. The online tool truly provides an opportunity for students to take a prescribed list of classes and meet with their advisor to have a conversation about which courses would be

best for them. Because the online tool gives students all the classes they could possibly take in the upcoming semester, it strongly encourages students to meet with their advisor to get input on the list of classes, assisting to create a shift from prescriptive to developmental advising.

This tool may also be useful when planning a student's career while they are still at a community college. Many students come with requirements that are unfulfilled (such as programming, when they focused on networking). This tool would help advisors and students plan for what courses to take, simulating the duration of their stay at a 4-year institution.

This project also has great potential for keeping track of the planning process that students utilize. By attaching a series of event-driven tracking systems that communicate with a server, we can analyze the way students plan their academic career. This development would be steering away from the low requirements that the current application features.

We are planning to make this system available to all through GitHub as it matures.

CONCLUSIONS

Developmental advising is a significant part of the core mission of any institution of higher education. As technology starts making its way also into this aspect of education, it is essential to refrain from the automatization of any process. Keeping in mind that students learn through experience, planning is an essential component of any aspect in life. Although this system is in its infancy, it shows great promise to offer a system that allows students to easily plan for their career in a manner that is not automated, and its simplicity of deployment allows for the quick implementation in any technological setting.

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