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Extending A+ to meet the requirements for electronic examinations

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Outline

1. Electronic exams in general

2. Architectural changes

3. Demo

4. Roadmap

Introduction

Currently there's a huge gap in the environment where exams are taken compared to one where course exercises are done

The availability of software tools, instant feedback and documentation are currently taken for granted in programming courses

However these tools have not been adopted successfully in exams in a large scale

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Requirements for the examination system

The First MVP

		TOOLS			
		Controlled		Free	
		SPACE		SPACE	
		Controlled	Free	Controlled	Free
TIME	Free	Exam aquarium	Home exercise taken on standardised device	Exam aquarium with own devices	Home exercise
	Controlled	Traditional exam	Exam taken at home on standardised device	Traditional exam session with own laptops	Home exam

(Developed based on a model by Rytkönen and Myyry [2014])

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The current design

Student UI	Exam Management	Grading	Infra
- Log when exam In progress - Restrict access - Simplify and Tweak UI	- Creating exam sessions - Manage exam questions	- Automatic and Manual grading - Distribution of Grading - Automatic grade calculation	- Hardware - Software tools - Access control - Network Management - Invigilation

Options for infrastructure

EXAM consortium has on-demand exam room

Exams in lecture hall on own devices with USB drives

Later on possibilities for home exams

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Changes made to A+ LMS

Rewritten most of the UI

Base template edited to for example limit navigation possibilities

Created new views to start and finish exams

Cleaner presentation of exercises to provided better overall view

In the future allows extension to mobile version

New database models

Stores information of exam sessions and attempts

Logs when students start and finish exams

```python
class ExamSession(models.Model):
    """
    Represents one instance of a course exam
    """

    course_instance = models.ForeignKey(
        CourseInstance, on_delete=models.CASCADE)
    exam_module = models.ForeignKey(
        CourseModule, on_delete=models.CASCADE, null=True)
    can_start = models.DateTimeField(editable=True, default=timezone.now)
    duration = models.IntegerField()
    start_time_actual = models.DateTimeField(
        editable=True, default=timezone.now)
    may_leave_time = models.DateTimeField(editable=True, default=timezone.now)
    room = models.CharField(max_length=255)

    objects = models.Manager()
    active_exams = ExamSessionManager()

    def __str__(self):
        # return self.course_instance
        return " ".join([str(self.course_instance), str(self.can_start)])

    def start_exam(self, user):
        attempt = ExamAttempt(
            exam_taken=self,
            student=user.userprofile,
            exam_started=timezone.now()
        )
        attempt.save()
```

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Demo

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Roadmap and future development ideas

Student UI

- Exam finish confirmation dialog

- Limiting the navigation when exam is in progress

- Revising past exams and feedback

- IDE run in browser

Exam management

- Options to select when automatic grading results are shown, when feedback or model answers are available etc.

- Randomized or personal questions

Grading

- Grading of partially or almost correct answers

- Improved manual grading UI

- UI for setting grade boundaries and calculating final grades

Infra

Pilot exams using USB drive during the Fall

Discussion how and when to pilot in EXAM classes

Running A+ in virtual OS