PDF Annotator For Moodle Quiz

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Objective

- Currently, there is no essay type answer annotation feature in moodle.

- Teacher has to download the PDF answers to essay questions, correct it in an outside Moodle environment and re-upload it in Moodle.

- A basic version of an essay-type answer annotation feature was developed by Vishal Rao and Tausif Iqbal [1]. The implementation in [1] caused the file size after annotation to blow up.

- In this project, our major goal is to improve the software by fixing this issue.

- Our objective is to add a PDF annotation feature for the quiz module wherein the properties of PDF are preserved and the size of the PDF is not considerably increased.

- This is a problem statement in MDL-65872

[1] Tausif Iqbal and Vishal Rao. GitHub Page: Quiz Annotator Plugin that Enables Teacher to Annotate Essay Type Question in moodle. https://github.com/TausifIqbal/moodle_quiz_annotator, 2021.

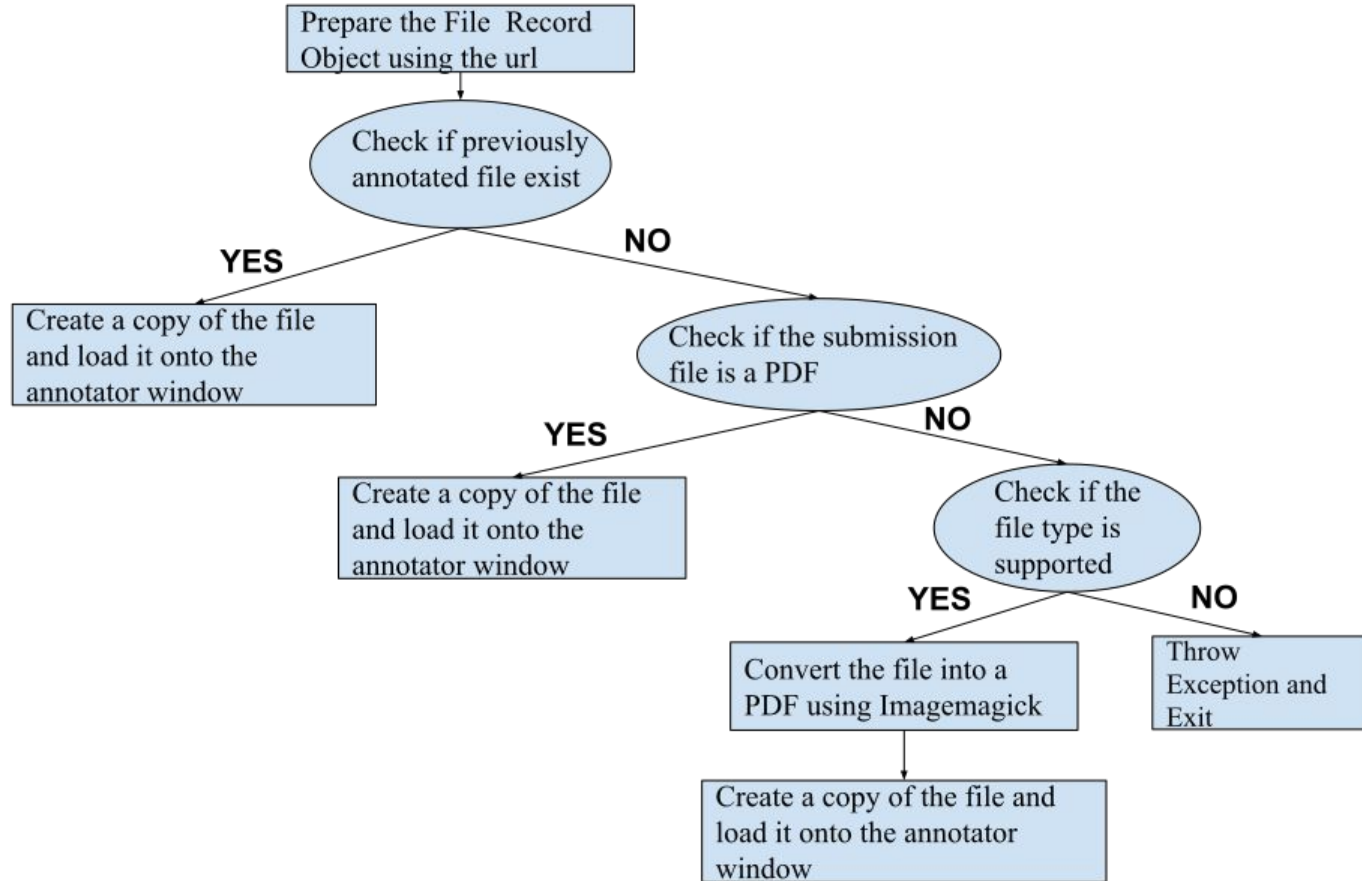# Recap of work done last semester

- Explored existing PDF annotators
  - PDF annotator in the assignment module
    - Uses YUI.js (not maintained, moodle recommends removing it)
  - PDF annotator developed last year
    - Converts PDF to image and reconverts the annotated image to PDF
    - Large size for the annotated PDF
    - Properties of PDF are lost (eg. text is not selectable)
- Explored PDF annotation libraries
  - Poppler and Cairo (used in Xournal application)
  - **FPDF and FPDI**

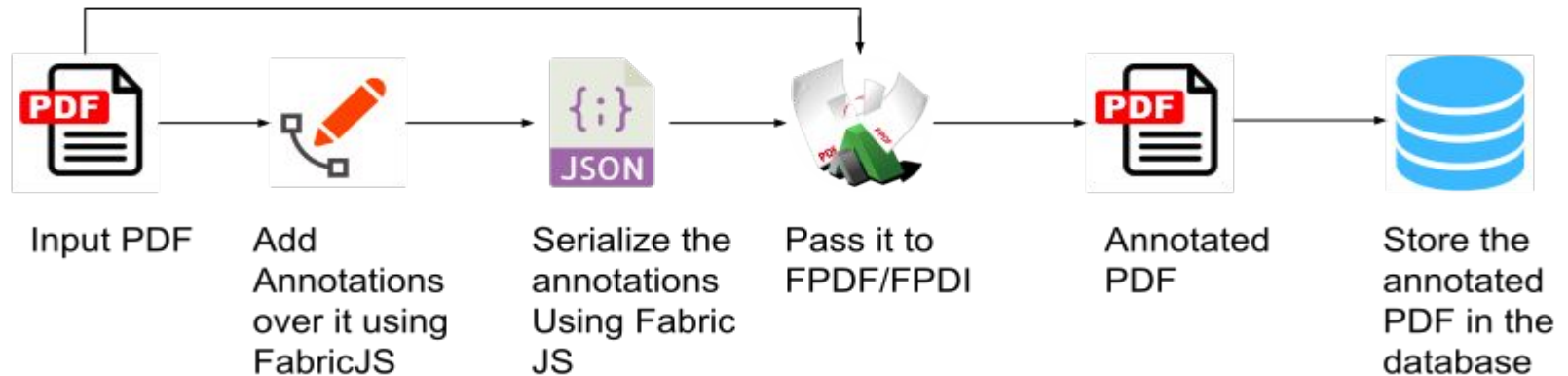# Loading the input file into the annotator

- Using Moodle File API, file to be annotated is retrieved from file storage and a url of the file is created using **component**, **attemptid**, **filename** etc.

- Imagemagick is used to convert different types of files into PDFs. Supported file types are
    - Image documents
    - Text documents

- The file to be annotated is loaded to the annotation window using the url of the file .

Loading the input file into the annotator

Workflow of the new PDF annotator

Input PDF → Add Annotations over it using FabricJS → Serialize the annotations Using Fabric JS → Pass it to FPDF/FPDI → Annotated PDF → Store the annotated PDF in the database

User interface of the annotator

- Using FabricJS library - for drawing objects and shapes over HTML Canvas

- Adapted the UI of the annotator made previous year

- User interface has tools for

  - Free hand drawing

  - Highlight box

  - Adding text

  - Selecting and moving

  - Deleting objects

  - Saving annotations

Fabric.js
Interactive Framework

Serialization of annotation data

- This is a crucial modification in our annotator which helps in reducing the annotated file size

- Serialization is used to convert all the data related to an annotation object in a JSON format for later reconstruction

- FabricJS has an inbuilt serialization function which we invoke for each annotation object after necessary transformations to obtain a JSON serialized data

- This JSON data is later converted to FPDF/FPDI annotation objects

Serialized data of tools

Highlight box

- left
- top
- width
- height
- fill
- Stroke
- scaleX
- scaleY

```
{
"type": "rect",
"originX": "left",
"originY": "top",
"left": 52.78,
"top": 101.58,
"width": 200,
"height": 50,
"fill": "rgb(255, 0, 0)",
"stroke": "rgb(255, 0, 0)",
"scaleX": 2.29,
"scaleY": 1.22
}
```

Text box

- left
- top
- fill
- text
- fontSize

```
{
"type": "i-text",
"originX": "left",
"originY": "top",
"left": 73.82,
"top": 139,
"fill": "rgb(33, 33, 33)",
"text": "This is the text",
"fontSize": "24",
"fontFamily": "Times New Roman"
}
```
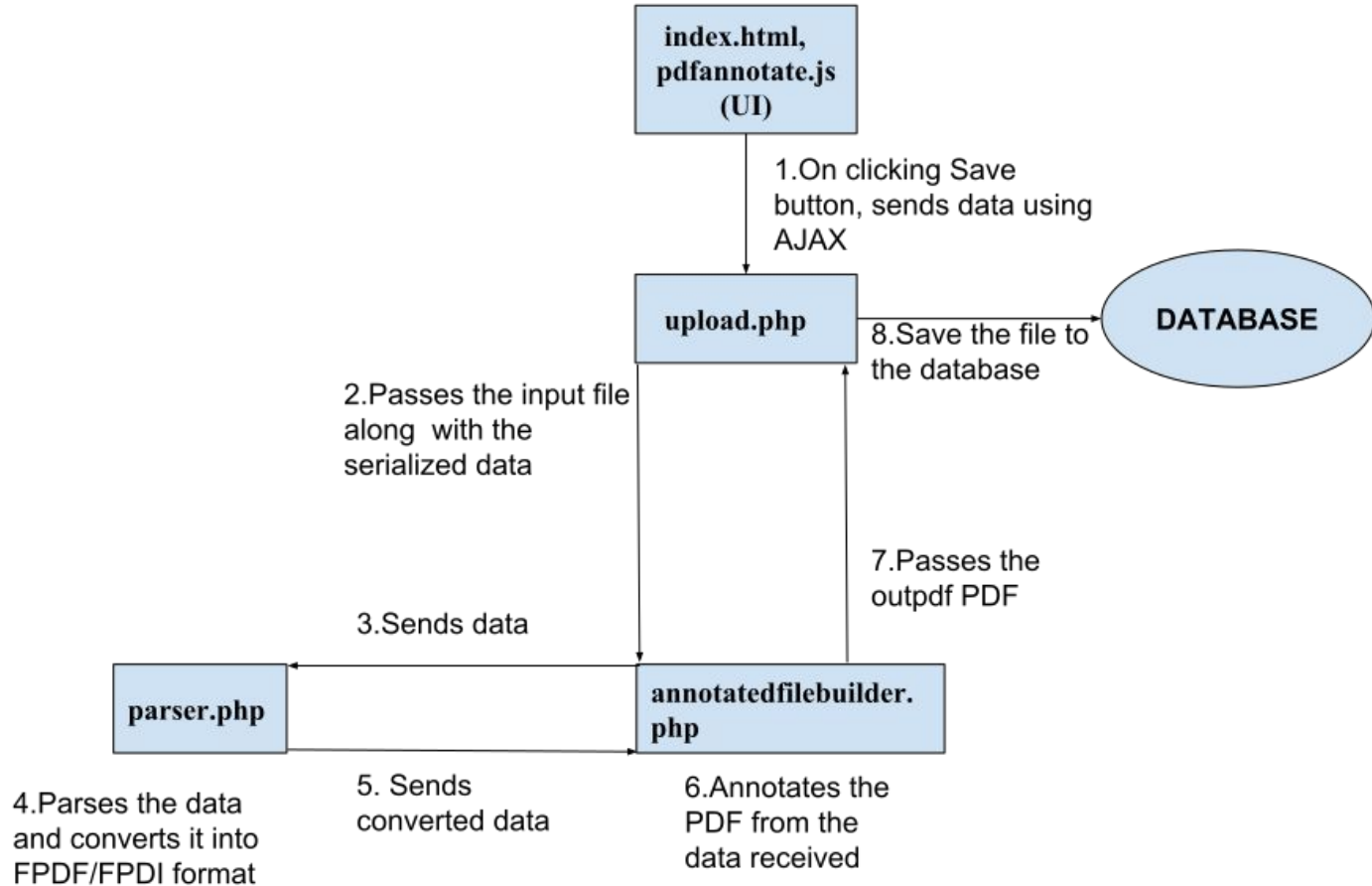
Serialized data of freehand drawing object

- Free hand drawing uses path object in fabricJS.

- The coordinate points in the path objects are extracted out along with the stroke color.

- To facilitate translation, the points obtained are displaced using transform matrix and path offset value.

Adding annotations over PDF document

- FPDF is a PHP library that aids in the generation of PDF documents and adding annotations over them.

- FPDI library helps to convert PDF documents to templates that can be used by FPDF.

- The serialized data from FabricJS is processed and converted into annotation object array of the format required by FPDF

- This annotation object array is then used for adding objects corresponding to the annotations to the FPDI class object.

- The FPDI class object then outputs a pdf which is saved locally.

Workflow of saving the annotated file

Error Handling & Bug Fixes

Graceful handling of the following scenarios with proper error messages

- Annotated file size limit

- Unsupported file types in Imagemagick

- PDF version greater than 1.4 in Ghostscript (new)

- Directory access permissions (new)

The following bugs were fixed from the previous code

- PHP 8 compatibility fixes

- UI fixes

Testing

- Moodle version 3.11 to 4.2 were tested for PHP version 7.4 and 8.0

- Tested file not successfully created scenario and file not updated into database scenario.

- Tested input pdf file not supported scenario and pdf version being greater than 1.4 scenario.

- Tested each tools and its working and other features supported by the UI.

- Comparison testing between the file shown in the UI and the pdf obtained after annotation.

- File size testing

Conclusion

- We made a new PDF annotator for the quiz module which does not increase the size of the annotated PDF and conserves the PDF properties

- We reused the user interface made last year. The UI uses FabricJS and FPDF/FPDI is used in the backend for annotation

- We tested it for versions 3.11 - 4.2 for PHP 7.4 & 8.0

- The deliverables of the project, including the source code, Makefile for easy installation, and supporting documentation are made available in GitHub

Future Work

- Making the PDF annotator a stand alone plug-in reusable with other modules like assignments

- Migrating as much code to PHP from Javascript for improved security, however ensuring responsiveness

- Standardising the code and testing methodology to comply with moodle conventions and to request for integration to moodle mainline

Demo

https://github.com/Parvathy-S-Kumar/Moodle_Quiz_PDF_Annotator/tree/main/Demo

Code

https://github.com/Parvathy-S-Kumar/Moodle_Quiz_PDF_Annotator

References

1. Tausif Iqbal and Vishal Rao. GitHub Page: Quiz Annotator Plugin that Enables Teacher to Annotate Essay Type Question in moodle.
   https://github.com/TausifIqbal/moodle_quiz_annotator
2. Moodle :
   - Moodle 4.1 source
     https://github.com/moodle/moodle/tree/MOODLE_401_STABLE
   - Moodle Assignment Plugin
     https://github.com/moodle/moodle/tree/MOODLE_401_STABLE/mod/assign
3. Ravisha Hesh. GitHub Page: Wrapper for PDF JS to Add Annotations .
   https://github.com/RavishaHesh/PDFJsAnnotations/
4. FPDF Library - PDF generator   :   http://www.fpdf.org/
5. FPDI Free PDF Document Importer   :   https://www.setasign.com/products/fpdi/about/
6. Fabric JS   :   http://fabricjs.com/

Thank You