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Sprint Evaluation

What is the progress of your project in this sprint? What goals are achieved? What problems are overcome? If you are updating your plans what are your justifications?

We have decided to add perspective correction functionality to our application. After some research, there were two main methods that is used perspective correction. First method was finding the closed contours on the image and approximating them to rectangles and the second method was applying line detection to coupon samples and finding borders of the coupon, after that the corners of the coupon border would be found by finding intersection of border lines. Sample codes are prepared by Mesut Yılmaz , and outputs are shared on weekly meetings. The program was finding many rectangles on the coupon, and after discussing this issue with our supervisor Asst. Prof Sinan Kalkan, we decided on a method to find the right rectangle that bounds the coupon. The method was finding best matches between line detected sample and edge detected sample. It was aiming to check if there is an edge on colored pixel. This approach failed because, finding edges and contours depends on the background of the coupon, since coupon color is white, the method tends to fail on light colored backgrounds, and it would not have a real time response on mobile phones. This decision is supported by ~25 samples and results are shared on weekly meetings. The other method,line detection, gave good results even on light colored backgrounds, so we decided to focus on detecting border lines. We will apply line detection more than one and threshold the lines by their length.

Two domestic and one foreign products are researched by Ulaş Dallı. Observations are gathered and proposed for the future product. These are:
- To provide the users with the closest retailer locations information via Google Maps of where they can play lottery,
- To allow users taking of photographs of multiple different coupons before drawing and to notify users with the gain when any drawing finished,
- To allow users to enter and to check the numbers manually,
- To notify users for user selected upcoming lotteries and Jackpot amount,
- To enable users to check past one year's lottery results.
Also studied on identification of coupon logos via Histogram Image Comparison Technique in OpenCV. By comparing a coupon image file with other types of coupons, their similarities are calculated via histogram comparison algorithms of OpenCV. Related source files and processed images are uploaded on OpenProject and will be uploaded on GitLab soon. The algorithms used to compare histograms are "Correlation" ,"Chi-square" ,"Intersection","Bhattacharyya", "Hellinger" and "Kullback-Leibler"
These algorithms produce some values as a result of histogram comparison indicating the relationship between images. Some's high values and some's low values represent the higher similarity between histograms. In the comparative experiment with different coupon logos and different histogram comparison algorithms, comparison of identified logo and other logos always produced values close to each other. (Note that although I said in weekly meeting I got different results for the comparison of the very same coupon, this was wrong. It, of course, gives the same histogram result and correctly matches to itself. This was even not a code bug, but a testing error.) This situation is undesired. It is needed to get more realistic results by preventing getting close results for different logos and preventing getting different results for the same logo on different coupons. In order to overcome this, a deeper research will be done on capabilities of OpenCV because comparison results must be realistic. For example, while Bhattacharyya algorithm produces results in [0,1] range, produced results are in [0.8,0.85] range. A study on how to better compare coupon logos with OpenCV will be conducted. Although the tasks, Recognition of the lottery game (T3) and Training Tesseract OCR (T6), were assigned to be completed in this sprint, after Sinan Kalkan's participation, tasks are changed and T3 could be started in the end of fifth week and of course this major task will take some time. Task T6 cannot be initiated yet with the same reason as task T3.

It is agreed to determine the type of the coupon through barcode recognition in the first meeting with our supervisor Asst. Prof. Sinan Kalkan. Related tasks are assigned to Ögem Çetin .ZBar Barcode Reader is used for scanning the barcode from the coupon samples. The number decoded from the barcode is a 16 digit number which is not a GTIN(Global Trade Item Number), a unique identifier for trade items in a universal database that can be 8, 12, 13 or 14 digit long . Therefore, the number read from the barcode couldn't be segmented into related fields like company code and product ID as in the case of GTIN. In the following

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meeting, it is suggested to investigate if there is a group of digits used repeatedly in the same type of coupons that can be considered as a product ID. In order to observe the digits specific to the type of the coupon, three samples for each coupon type are bought from different offices in different times. After the analysis of the coupon samples, it is observed that there is no group of digits used repeatedly in coupons that can be used to identify the type of the coupon. Therefore, since the necessary information couldn't be obtained from the barcode, this task is canceled.

Team evaluation

How well your is team working together? How many meetings did you hold? Are you planning any changes in your cooperation strategy? Which work is completed by which member (in a Gannt chart)?

All team members stick to weekly meetings. We were more active on OpenProject compared to first iteration.

After participation of Asst. Prof Sinan Kalkan as a supervisor, we decided to add perspective correction and recognition of coupon type functionalities. Because of that, task distributions and roles of team members have changed in this iteration.

The effects of these changes are below,

- Perspective Correction task is assigned to Mesut Yılmaz . In startup document it is stated that Mesut Yılmaz will be responsible for recognition of coupon type (T3), but this task is given to Ulaş Dallı by our supervisor.
- Preprocessing Of Image For Line Detection (stated as T4 in startup document) task is postponed to next iteration.
- A new task which is not stated in Startup Document , "Research on Similar Applications and Suggestions for the Future Product" is assigned to Ulaş Dallı by our supervisor.

- Ögem Çetin is assigned to Research On Barcode Of Lottery Coupons And Barcode Recognition task. This task was not stated on Startup Document and newly assigned by our supervisor. Ögem Çetin also worked on detection of bounding box of each digit on coupons.
- Training Tesseract OCR (T6 in Startup Document) is also postponed to the next iteration.

List of new tasks :

NT1 : Research on Perspective Correction
NT2: Coding "Finding Shapes via Contour " and " Finding Coupon borders by Line Detection" methods
NT3: Collecting sample coupon photos with different backgrounds
NT4: Testing perspective correction codes on collected samples.
NT5 : Research on Similar Applications and Suggestions for the Future Product
NT6 : Research on Barcode information on Lottery Coupons
NT7: Detecting Bounding Box of Each Digit On Coupons

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Task	Assigned Member	1st week	2nd week	3rd week
NT1	Mesut Yılmaz	■		
NT2	Mesut Yılmaz		■	
NT3	Mesut Yılmaz		■	■
NT4	Mesut Yılmaz			■
NT5	Ulaş Dallı	■	■	
T3	Ulaş Dallı			■
NT6	Ögem Çetin	■	■	
NT7	Ögem Çetin			■

Backlog Updates

What are your backlog updates?

For perspective correction task , it is not expected that the code is really depends on how well the user takes the photo. Backgrounds of images directly affect line detection and contour finding codes, for example; when background color becomes lighter , border lines tends to disappear because the coupon sides are white.

- Converting the C++ OpenCV codes to Java OpenCV code.

- Recognition of the lottery game (T3) (Remaining: %50)
*After Sinan Kalkan's participation, tasks are changed, new tasks are assigned and so, T3 could be started at the end of the fifth week and of course, this major task will take some time.
- Training Tesseract OCR (T6) (Remaining: %100)
*Task T6 cannot be initiated because of the new assigned tasks and also, Ögem Çetin is the new assignee of this task.