

# Supplementary Material for FASTER

**Synthetic Data:** For the supervised training of our pipeline, we utilized a dataset of 150,000 labeled images as mentioned in the work of Qu et al. [45]. For evaluation, we use the Tamper-Syn2k [45] dataset, which consists of 2,000 paired images specifically designed for evaluation purposes. These paired images were created by rendering different texts with consistent styles, including font, size, color, spatial transformation, and background image. To generate these paired images, a collection of 300 fonts and 12,000 background images are used. These background images were subjected to random rotation, curve, and perspective transformations to introduce diversity. It is worth noting that we also generated an additional set of 100,000 labeled images using 2,500 fonts. This expanded dataset was employed specifically for training purposes of the proposed method.

**Real Data:** In our research on enhancing natural screen text editing on real scene images, we utilized a dataset consisting of real scene images obtained from the MOSTEL [45]. This dataset is generated by the authors using random cropped images from ICDAR 2013 [32], MLT-2017 [38] MLT-2019 [37] datasets.

## A. Implementation Details

The implementation process involved training the U-Net backbone using input images resized to  $64 \times 256$ , utilizing a synthetic dataset as outlined in our main submitted draft. We employ the U-Net to approximate the binary mask of the input image. The input images are the same as those taken by the CTB Block of our model, and corresponding binary masks are provided in the dataset as ground truth. Our approach utilized the Adam optimizer [33] with a learning rate set at 0.001. The U-Net underwent training for a total of 20 epochs, with each batch containing a single iteration. The complete pipeline was implemented using PyTorch [24] and trained on a single NVIDIA 4080 OC GPU.

## B. Further Analysis and Discussions

**Not Just Another STE Method** Please note that our method is not just "another method" that provides better scene text editing. Our work aims to develop a novel *font-agnostic method* that simultaneously generates text in arbitrary styles and locations while preserving a natural and realistic appearance through a simple combination of mask generation and text style transfer as shown by **attention map visualization** in Figure 9. To the best of our knowledge, this is the first work of its kind. Moreover, our approach differs from the existing methods as they directly modify all image pixels. Instead, the proposed method has introduced a filtering mechanism to remove background distractions, allowing the network to focus solely on the text regions where editing is required as shown in some qualitative examples in Figure 8 for synthetic and Figure 11 for real images. Additionally, our results elegantly spotlight our method's prowess across varied scene text styles. We also see in Figure 10 some examples of images containing arbitrarily shaped text where the model still can perform well.

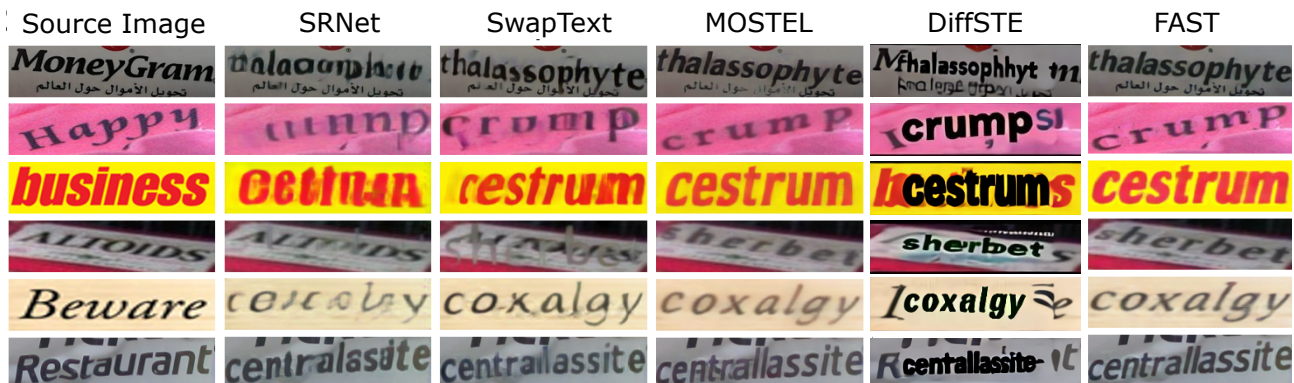


Figure 6. Visual comparison of FASTER with current SOTA methods on real scenes.



Figure 7. Some failure cases of our model.

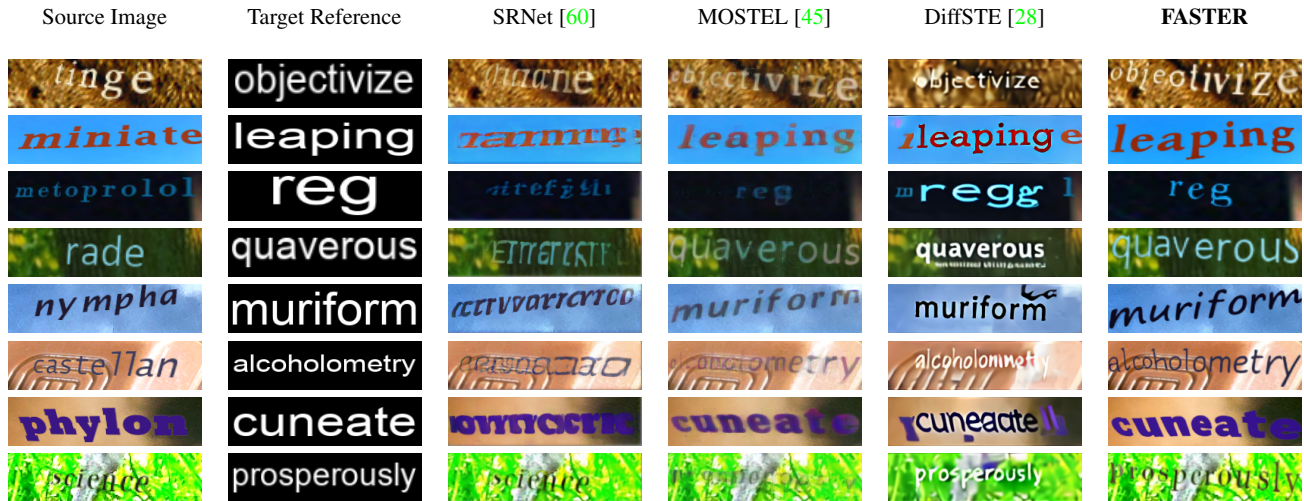


Figure 8. Qualitative comparison of FASTER with SOTA on Synthetic Data samples



Figure 9. **How FASTER Works:** Attention visualization of different phases of image editing using FASTER on a source image with "millrace" and target image with "ferriheme" (from top left to bottom right in order)



Figure 10. Qualitative image editing using FASTER on some arbitrary-shaped text examples from Synthetic dataset

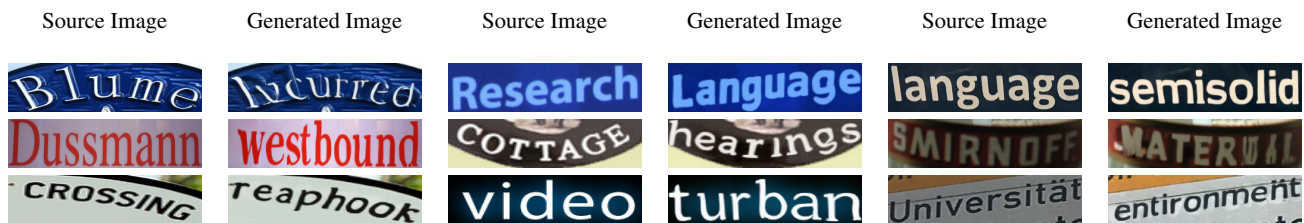


Figure 11. Qualitative image editing examples using FASTER on the Real dataset.

**FASTER attains the best results (in terms of average inference time) when compared to existing SOTA STE models.** In Table 1, we have thoughtfully presented the average time taken by each of the methods under consideration. This table serves as a valuable reference point for assessing the efficiency of the different approaches. Specifically, it is noteworthy that that "FASTER" stands out in terms of its computational speed during inference. The model *clocks an impressive speed of 31.12 milliseconds for generating a single image*. This efficiency is not only remarkable in isolation but also positions "FASTER" as a significantly swifter option compared to the previously employed methodologies specially *compared to stable diffusion-based [28] approaches which take almost 400 times more time for single image inference*. This observation underscores the strides made in optimizing the computational efficiency of our approach, highlighting its potential to expedite the text image editing operation effectively.

**What makes FASTER establish font-agnostic text editing?** As demonstrated in Table 6 and Table 7, we examine how different font types and sizes impact our outcomes. This is an ablation study, not a comparison study with SOTA methods and



Figure 12. Qualitative evaluation of editing on real images from Internet

hence incremental accuracy gain is not applicable here. The results from Table 6, where we explore *Arial*, *Times New Roman*, and *Sans Serif* fonts, indicate minimal influence on our method's performance. Similarly, Table 7, maintaining different sizes (25 and 28) of fixed font, also showcases negligible effects. Importantly, it's worth noting that our training synthetic dataset encompasses diverse fonts and sizes, being a standard OCR dataset. These collective findings underscore our method's font-agnostic nature, where it consistently performs across font variations. It can be noted that if we change different fonts and

font sizes, the accuracy of our method does not change much. Hence, our method is robust in different fonts and font sizes.

### C. Visualizing Real-World Scene Editing

This section highlights some of the key observations, qualitative analysis and case studies to demonstrate the potential of FASTER in real-world scene editing applications.

**Advertising and Marketing:** STE allows marketers to update product details, prices, and promotional messages in real-world advertisements, posters, and billboards efficiently and effectively. As shown in Figure 12, the second example shows an advertisement board, which preserves the background style and structural properties while editing text seamlessly between "LOWEST" and "COOLEST". Also, in third example use-case as shown we see the content edit between "DTANJUNG" and generated "DOCKYARD" where the content is in a different language (Malaysian/Indonesian).

**Retail and E-commerce:** Retailers can update prices, product descriptions, and availability information on shelf labels and in online product images, ensuring accuracy and compliance with marketing strategies. One of the best examples as shown in Figure 14 is the "DOUBLEMINT" to "SINGLEMINT" label change with the product brand name. This shows how FASTER can easily impact marketing e-commerce brand visuals.

**Artistic and Creative Expressions:** As shown in first example in Figure 12, FASTER can mimic and adapt specific font colors seamlessly with content editing. "HAPPY BIRTHDAY" could integrate "MERRY BIRTHDAY" preserving all kinds of typographic attributes related to font color, style, letter spacing, alignment and font size. This could eventually help artists and designers use FASTER to incorporate text into their visual creations, with unique and expressive design properties in the user-interface.

**Augmented Reality (AR) and Mixed Reality (MR):** FASTER enhances the user experience by overlaying informative text, such as navigation instructions or facts, onto real-world scenes in AR and MR applications. As shown in Figure 16, we observe in all the examples how the content could have tampered with the original navigation instructions in response to street signboards or location milestone blocks. It also promotes visual consistency which ensures that text edits align with the overall context and design, promoting an extremely cohesive user experience.

**Visually-Rich Document Editing:** An interesting case study was performed for some visually-rich document samples as illustrated in Figure 17 and Figure 18. The results illustrate that indeed FASTER has some real potential into content editing for scientific papers as shown in Figure 17. This gives it a really powerful application for editing and generative tasks for document analysis. "CHAPTER 1" to "SECTION 1" edit or changing "2 AUTHORS" to "2 Members" in the given document image makes it hard for humans to distinguish between real and synthetically edited (generated) documents. Also, Figure 18 shows more infographic-like documents where different header style elements have been preserved with edited content which blends seamlessly with the overall document structure.



Figure 13. More Qualitative Results from real-world Internet images



Figure 14. More Results from Internet Results



Figure 15. Some Specific difficult real-world examples



Figure 16. How FASTER behaves in image editing with stop signals and bulletins in roads



# Document Analysis as a Qualitative Research Method

Glenn A. Bowen  
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### ABSTRACT

This article examines the function of documents as a data source in qualitative research and discusses document analysis procedure in the context of actual research experiences. Targeted to research novices, the article takes a nuts-and-bolts approach to document analysis. It describes the nature and forms of documents, outlines the advantages and limitations of document analysis, and offers specific examples of the use of documents in the research process. The application of document analysis to a grounded theory study is illustrated.

**Keywords:** Content analysis, documents, grounded theory, thematic analysis, triangulation.

Organisational and institutional documents have been a staple in qualitative research for many years. In recent years, there has been an increase in the number of research reports and journal articles that mention document analysis as part of the methodology. What has been rather glaring is the absence of sufficient detail in most reports found in the reviewed literature, regarding the procedure followed and the outcomes of the analyses of documents. Moreover, there is some indication that document analysis has not always been used effectively in the research process, even by experienced researchers.

This article examines the place and function of documents in qualitative research. Written mainly for research novices, the article describes the nature and forms of documents, outlines the strengths and weaknesses of document analysis, and offers specific examples of the use of documents in the research process. Suggestions for doing document analysis are included. The fundamental purpose of this article is to increase knowledge and understanding of document analysis as a qualitative research method with a view to promoting its effective use.

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## 2 Authors + 1 Institution

### CHAPTER I. Down the Rabbit-Hole

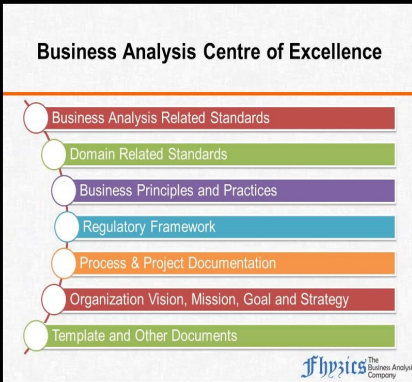
Alice was beginning to get very tired of sitting by her sister on the bank, and of having nothing to do: once or twice she had peeped into the book her sister was reading, but it had no pictures or conversations in it, 'and what is the use of a book,' thought Alice 'without pictures or conversation?' So she was considering in her own mind (as well as she could, for the hot day made her feel very sleepy and stupid), whether the pleasure of making a daisy-chain would be worth the trouble of getting up and picking the daisies, when suddenly a White Rabbit with pink eyes ran close by her. There was nothing so VERY remarkable in that; nor did Alice think it so VERY much out of the way to hear the Rabbit say to itself, 'Oh dear! Oh dear! I shall be late!' (when she thought it over afterwards, it occurred to her that she ought to have wondered at this, but at the time it all seemed quite natural); but when the Rabbit actually TOOK A WATCH OUT OF ITS WAISTCOAT-POCKET, and looked at it, and then hurried on, Alice started to her feet, for it flashed across her mind that she had never before seen a rabbit with either a waistcoat-pocket, or a watch to take out of it, and burning with curiosity, she ran across the field after it, and fortunately was just in time to see it pop down a large rabbit-hole under the hedge. In another moment down went Alice after it, never once considering how in the world she was to get out again. The rabbit-hole went straight on like a tunnel for some way, and then dipped suddenly down, so suddenly that Alice had not a moment to think about stopping herself before she found herself falling down a very deep well.

## 2 Members + 1 Institution

### SECTION I. Down the Rabbit-Hole

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Figure 17. Some results on image editing with FASTER on Document Images



### PROPERTY MANAGEMENT AGREEMENT

**ARTICLES**

- This Property Management Agreement (hereinafter referred to as the "Agreement") is entered into on \_\_\_\_\_ (the "Effective Date"), by and between \_\_\_\_\_ as the "Owner", and \_\_\_\_\_ with an address of \_\_\_\_\_ (hereinafter referred to as the "Agent") (collectively referred to as the "Parties").

**GENERAL**

- Hereby, the Owner exclusively appoints the Agent to manage the property that is located at \_\_\_\_\_

- The Agent hereby accepts such responsibility and agrees to manage the property aforementioned. The Owner agrees to pay the fees associated with the services that the Agent will provide when managing the aforementioned property.

**TERM**

- This Agreement shall be effective on the date of signing this Agreement (hereinafter referred to as the "Effective Date") and will end on \_\_\_\_\_

**THE RESPONSIBILITIES OF THE AGENT**

- To rent and lease as well as operate the property.
- To collect rent and monies applicable from potential tenants in due time. However, the Agent will not bear the responsibilities of the potential tenants in case of refusal of payment or other.
- To provide a monthly accounting of rents received and paid expenses as well as any other applicable incomes, monies or sums to the Owner.
- To decorate, improve, repair and maintain the property when needed.
- To hire as well as supervise employees (if any) when needed.
- To inform the Owner of any improvements and repairs that exceed \_\_\_\_\_ and to obtain consent from the Owner prior to paying such fees.

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## Qualitative Document Analysis

In this session, I adopt a rather eclectic view of 'document'. In addition to typical sources (e.g. media reports, government papers, minutes of meetings, company reports), I include documents that are read as part of the literature review and also the working documents that become your thesis. My rationale for this is that similar issues and skills are involved in the 'analysis' of all of them.

Hugh Willmott  
Research Professor in Organizational Analysis  
Cardiff Business School

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## Qualitative Generation Analysis

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Research Professor in Organizational Analysis  
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Figure 18. Some more results on image editing with FASTER on Document Images