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University of Amsterdam at INEX 2010: Ad hoc and Book Tracks

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Abstract. In this paper we describe our participation in INEX 2010 in the Ad Hoc Track and the Book Track. In the Ad Hoc track we investigate the impact of propagated anchor-text on article level precision and the impact of an element length prior on the within-document precision and recall. Using the article ranking of an document level run for both document and focused retrieval techniques, we find that focused retrieval techniques clearly outperform document retrieval, especially for the Focused and Restricted Relevant in Context Tasks, which limit the amount of text than can be returned per topic and per article respectively. Somewhat surprisingly, an element length prior increases within-document precision even when we restrict the amount of retrieved text to only 1000 characters per topic. The query-independent evidence of the length prior can help locate elements with a large fraction of relevant text. For the Book Track we look at the relative impact of retrieval units based on whole books, individual pages and multiple pages.

1 Introduction

In this paper, we describe our participation in the INEX 2010 Ad Hoc and Book Tracks. Our aims for the Ad Hoc Track this year were to investigate the impact of an element length prior on the trade-off between within-document precision and recall. In previous years we merged article and element level runs—using the article ranking of the article run and the element run to select the text to retrieve in those articles—and found that this can improve performance compared to individual article and element retrieval runs. But how much text should we retrieve per article?

For the Book Track we look at the relative impact of books, individual pages, and multiple pages as units of retrieval for the Best Books and Prove It Tasks.

The rest of the paper is organised as follows. Then, in Section 2, we report our runs and results for the Ad Hoc Track. Section 3 briefly discusses our Book Track experiments. Finally, in Section 4, we discuss our findings and draw preliminary conclusions.

2 Ad Hoc Track

For the INEX 2010 Ad Hoc Track we aim to investigate:

- The effectiveness of anchor-text for focused ad hoc retrieval. Anchor-text can improve early precision in Web retrieval [8], which might be beneficial for focused retrieval in Wikipedia as well. The new Focused and Restricted Relevant in Context Tasks put large emphasis on (early) precision.
- The relation between element length and within-document precision and recall. With the new tasks restricting systems to return only a limited number of characters per article (Restricted Relevant in Context Task) or per topic (Focused Task), an element length prior might be less effective, as it increases the chances of retrieving irrelevant text.

We will first describe our indexing and retrieval approach, then the official runs, and finally per task, we present and discuss our results.

2.1 Indexing

In this section we describe the index that is used for our runs in the ad hoc track. We used Indri [14] for indexing and retrieval. Our indexing approach is based on earlier work [1–3, 11–13].

- *Section index*: We used the `<section>` element to cut up each article in sections and indexed each section as a retrievable unit. Some articles have a leading paragraph not contained in any `<section>` element. These leading paragraphs, contained in `<p>` elements are also indexed as retrievable units. The resulting index contains no overlapping elements.
- *Article index*: We also build an index containing all full-text articles (i.e., all wikipages) as is standard in IR.
- *Anchor text index*: For this index we concatenated all propagated anchor text of an article as a single anchor text representation for that article.

For all indexes, stop-words were removed, and terms were stemmed using the Krovetz stemmer. Queries are processed similar to the documents. This year we only used the CO queries for the official runs.

2.2 Category Evidence

Based on previous experiments, we used category distance scores as extra evidence for ranking [9]. We determine two target categories for a query based on the top 20 results. We select the two most frequent categories to which the top 20 results are assigned and compute a category distance score using parsimonious language models of each category. This technique was successfully employed on the INEX 2007 Ad hoc topics by Kaptein et al. [6] and on the larger INEX 2009 collection [10] with two sets of category labels [9]; one based on the *Wikipedia* category structure and one based on the *WordNet* category labels. Koolen et al. [9] found that the labels of the original Wikipedia category structure are more effective for ad hoc retrieval. In our experiments, we use the original Wikipedia category labels.

2.3 Runs

Combining the methods described in the previous section with our baseline runs leads to the following official runs.

Article an article index run with length prior ($\lambda = 0.85$ and $\beta = 1$).

ArticleRF an article index run with length prior ($\lambda = 0.85$ and $\beta = 1$) and relevance feedback (top 50 terms from top 10 results).

Anchor anchor text index run without length prior ($\lambda = 0.85$ and $\beta = 0$).

AnchorLen anchor text index run with length prior ($\lambda = 0.85$ and $\beta = 1$).

Sec a section index run without length prior ($\lambda = 0.85$ and $\beta = 0$).

SecLen a section index run with length prior ($\lambda = 0.85$ and $\beta = 1$).

From these initial runs we have constructed our baseline runs:

Base the ArticleRF combined with the category scores based on the 2 most frequent categories of the top 20 results.

Base Sec the Baseline run where an article is replaced by the sections of that article retrieved by the Sec run. If no sections for that article are retrieved, the full article is used.

Fusion a linear combination of the ArticleRF and the AnchorLen runs with weight $S(d) = 0.7ArticleRF(d) + 0.3AnchorLen(d)$. The combined run is used to compute category scores based on the 2 most frequent categories of the top 20 results, which are then combined with the merged article and anchor text scores.

Fusion Sec the Fusion run where an article is replaced by the sections of that article retrieved by the Sec run. If no sections for that article are retrieved, the full article is used.

For the Focused Task, we submitted two runs:

Base Sec F1000 Topic : The Base Sec run with only the first 1000 characters retrieved for each topic.

Base Sec F100 Article : The Base Sec run with only the first 100 characters retrieved per article, cut-off after 1000 characters retrieved for each topic.

With the first 1000 characters retrieved, we expect to return only very few documents per topic. With a restriction of at most N characters per document, we can control the minimum number of documents returned, thereby increasing the possible number of relevant documents returned. Both runs have the retrieved sections grouped per article, with the sections ordered according to the retrieval score of the Sec run. That is, if sections s1, s2 and s3 of document d1 are retrieved by the Sec run in the order (s2, s3, s1), then after grouping, s2 is still returned first, then s3 and then s1. The first 1000 characters retrieved will come mostly from a single document (the highest ranked document). With a limit of 100 characters per article, the first 1000 characters will come from at least 10 documents. Although precision among the first 10 documents will probably be lower than precision at rank 1, the larger number of retrieved documents might

give the user access to more relevant documents. We will look at the set-based precision of the 1000 characters retrieved as well as the article-based precision and the number of retrieved and relevant retrieved articles.

For the Relevant in Context Task, we submitted two runs:

Base SecLen : the baseline run Base SecLen described above, cut off after the first 1500 results.

Fusion Sec : the baseline run Fusion Sec described above, cut off after the first 1500 results.

The Base and Fusion runs will allow us to see the impact of using propagated anchor-text for early precision.

For the Restricted Relevant in Context Task, we submitted two runs:

Base F500 Article : the Base run reduced to the first 500 characters per retrieved article, and cut off after the first 1500 results.

Base Sec F500 Article : the Base Sec run reduced to the first 500 characters per retrieved article, and cut off after the first 1500 results.

Article retrieval is a competitive alternative to element retrieval when it comes to focused retrieval in Wikipedia [2, 4]. The full per-article recall of article retrieval makes up for its lack in focus. However, for the Restricted Relevant in Context Task, the amount of text retrieved per article is limited to 500 characters, which reduces the high impact of full within-document recall and puts more emphasis on achieving high precision. Relevant articles tend to have relevant text near the start of the article [5], which could give fair precision with the first 500 characters of an article. On the other hand, using the more focused evidence of the section index on the same article ranking, we can select the first 500 characters of the most promising elements of the article. With a restricted number of characters per article, and therefore restricted recall, we expect to see a clearer advantage in using focused retrieval techniques.

We discovered an error in the baseline runs, which caused our official runs to have very low scores. In the next sections, we show results for both the officially submitted runs and the corrected runs.

2.4 Thorough Evaluation

We first look at the performance of the baseline runs using the Thorough interpolated precision measure. Results can be found in Table 1. We make the following observations:

- The Fusion run is less effective than the Base run. The anchor text does not help early precision.
- The length prior on the sections increases recall for the cost of a slight drop in early precision.
- The focused runs have a lower MAiP but a higher early precision than the article level runs. The article level runs have a much higher recall, and thereby score better on average precision. But the focused runs retrieve less irrelevant text and score better on early precision.

Table 1: Interpolated precision scores of the baseline runs (runs in italics are official submissions, runs with an asteriks are the corrected versions)

Run id	MAiP	iP[0.00]	iP[0.01]	iP[0.05]	iP[0.10]
Base	0.2139	0.4398	0.4219	0.3810	0.3577
Fusion	0.1823	0.4001	0.3894	0.3370	0.3189
Base Sec	0.1555	0.5669	0.5130	0.4039	0.3600
*Base SecLen	0.1702	0.5507	0.5100	0.4162	0.3784
*Fusion Sec	0.1317	0.5447	0.4632	0.3439	0.2967
<i>Base SecLen</i>	0.0723	0.3308	0.2910	0.2184	0.1944
<i>Fusion Sec</i>	0.0678	0.3027	0.2694	0.2110	0.1906

Table 2: Results for the Ad Hoc Track Focused Task (runs in italics are official submissions, runs with an asteriks are the corrected versions)

Run id	# ret.	# rel.	ret. $P_{article}$	P_{char}	iP[0.00]	iP[0.01]
<i>Base Sec F1000 Topic</i>	65	20	0.3301	0.1232	0.1694	0.0386
<i>Base Sec F100 Article</i>	529	165	0.3105	0.1162	0.2468	0.0338
*Base Sec F1000 Topic	1.29	0.81	0.6250	0.3490	0.4012	0.1376
*Base Sec F100 Article	10.06	5.27	0.5229	0.2445	0.4626	0.1140
Base SecLen F1000 Topic	1.29	0.81	0.6186	0.3526	0.3903	0.1518
Base SecLen F100 Article	10.06	5.27	0.5229	0.2677	0.5015	0.1226
Base F1000 Topic	1.10	0.69	0.6250	0.2806	0.2828	0.0737
Base F100 Article	10.00	5.23	0.5231	0.1415	0.2623	0.0340

2.5 Focused Task

We have no overlapping elements in our indexes, so no overlap filtering is done. Table 2 shows the results for the Focused Task. We make the following observations:

- The first 1000 retrieved characters gives higher precision than first 100 per article up to 1000 characters. But restricting each article to 100 characters, many more articles, including relevant articles, are retrieved. Thus, although the set-based precision of the F100 Article runs is lower, they do give direct access to many more relevant documents.
- The focused runs Base Sec and Base SecLen have a higher set-based character precision than the article level Base run. The length prior on the section index has a positive impact on the precision of the first 1000 characters. The Base Sec and Base SecLen runs have the same number of retrieved articles and retrieved relevant articles, but the Base SecLen run has more relevant text in the first 1000 characters. The query-independent length prior helps locate elements with a larger proportion of relevant text.

2.6 Relevant in Context Task

For the Relevant in Context Task, we group results per article. Table 3 shows the results for the Relevant in Context Task. We make the following observations:

Table 3: Results for the Ad Hoc Track Relevant in Context Task (runs in italics are official submissions, runs with an asteriks are the corrected versions)

Run id	MAgP	gP[5]	gP[10]	gP[25]	gP[50]
<i>Base Sec Len</i>	0.0597	0.1492	0.1330	0.1080	0.1031
<i>Fusion Sec</i>	0.0563	0.1207	0.1068	0.1008	0.0963
Base	0.1613	0.2900	0.2619	0.2123	0.1766
Base Sec	0.1615	0.3026	0.2657	0.2112	0.1763
*Base Sec Len	0.1646	0.3149	0.2790	0.2213	0.1817
Fusion	0.1344	0.2849	0.2399	0.1945	0.1547
*Fusion Sec	0.1294	0.2840	0.2427	0.1917	0.1548

Table 4: Results for the Ad Hoc Track Restricted Relevant in Context Task (runs in italics are official submissions, runs with an asteriks are the corrected versions)

Run id	MAgP	gP[5]	gP[10]	gP[25]	gP[50]
<i>Base F500 Article</i>	0.0576	0.1439	0.1191	0.1053	0.0980
<i>Base Sec F500 Article</i>	0.0566	0.1375	0.1199	0.1040	0.0952
*Base F500 Article	0.1358	0.2516	0.2186	0.1696	0.1473
*Base Sec F500 Article	0.1503	0.2592	0.2288	0.1887	0.1624
Base SecLen F500 Article	0.1545	0.2666	0.2368	0.1868	0.1570

- The difference between the Base and Fusion runs is small.
- The length prior on the section index results in higher early and average precision.

2.7 Restricted Relevant in Context Task

The aim of the Restricted Relevant in Context task is to return relevant results grouped per article, with a restriction to return no more than 500 characters per article. Table 4 shows the results for the Best in Context Task. We make the following observations:

- Similar to the normal Relevant in Context task, the focused run Base Sec F500 Article has somewhat better precision than the run based on the full articles.
- A length prior over the element lengths (Base SecLen F500 Article) leads to a further improvement in precision. Thus, longer elements give higher precision in the first 500 characters.

In summary, with the restrictions on the amount of text per article and per topic that can be retrieved, focused retrieval techniques clearly outperform standard document retrieval. What is somewhat surprising is that a length prior on the section index is effective even when we use the article ranking of an article level run. The query-independent length prior helps locate elements with a large fraction and amount of relevant text.

3 Book Track

In the INEX 2010 Book Track we participated in the Best Book and Prove It tasks. Continuing our efforts of last year, we aim to find the appropriate level of granularity for focused book search. The BookML markup has XML elements on the page level. In the assessments of last year, relevant passages often cover multiple pages [7]. With larger relevant passages, query terms might be spread over multiple pages, making it hard for a page level retrieval model to assess the relevance of individual pages.

Can we better locate relevant passages by considering larger book parts as retrievable units? One simple option is to divide the whole book in sequences of n pages. Another approach would be to use the logical structure of a book to determine the retrievable units. The INEX Book corpus has no explicit XML elements for the various logical units of the books, so as a first approach we divide each book in sequences of pages.

Book index : each whole book is indexed as a retrievable unit.

Page index : each individual page is indexed as a retrievable unit.

5-Page index : each sequence of 5 pages is indexed as a retrievable unit. That is, pages 1-5, 6-10, etc., are treated as text units.

This year's topics are factual statements. For the Best Book Task the aim is to retrieve the most relevant books for the topic of the statement. For the Prove It Task the aim is to return pages that either confirm or refute the factual statement. We submitted six runs in total: two for the Best Book (BB) task and four for the Prove It (PI) task.

Book : a standard Book index run. Up to 100 results are returned per topic.

Book RF : a Book index run with Relevance Feedback (RF). The initial queries are expanded with 50 terms from the top 10 results.

Page : a standard Page index run.

Page RF : a Page index run with Relevance Feedback (RF). The initial queries are expanded with 50 terms from the top 10 results.

5-page : a standard 5-Page index run.

5-Page RF : a 5-Page index run with Relevance Feedback (RF). The initial queries are expanded with 50 terms from the top 10 results.

At the time of writing, no relevance assessments have been made. Therefore we cannot yet provide any evaluation results.

4 Conclusion

In this paper we discussed our participation in the INEX 2010 Ad Hoc and Book Tracks.

For the Ad Hoc Track we found that, with the restrictions on the amount of text per article and per topic that can be retrieved, focused retrieval techniques

clearly outperform standard document retrieval. What is somewhat surprising is that a length prior on the section index is effective even when we use the article ranking of an article level run. The query-independent length prior helps locate elements with a large fraction and amount of relevant text.

For the Book Track, no evaluation results have been released. Hopefully, we can report results for the final proceedings.

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