Analysis of Scrolling

1. Analyse the performance of the scrollbar:

   A. Point(D, W) - Pointing involves moving the finger to a target of width W at distance D, whether the finger is touching the surface or not. For example, D1 represents the initial distance of the finger from the scrollbar, D2 represents the position of the scrollbar elevator, and D3 represents the destination position. W1, W2, and W3 represent the width of the scrollbar. And we would have T1, T2 and T3 which represents the time that takes for each movement.
   Touch and Release - Putting the finger on the surface and releasing it. These operations take 100ms each.
   The scrolling action using the scrollbar involves the following steps:
   The user initially points to the scrollbar, moving their finger from D1 to D2, targeting the scrollbar elevator with width W2.
   After reaching the elevator, the user moves it to the desired destination position, transitioning from D2 to D3 while targeting a width of W3.
   Throughout these movements, the user may need to touch and release the screen, which incurs a 100ms delay for each touch and release operation.

   B. Moving the finger to the elevator: 692 ms,
   Moving to the 2d page: 2/10 pages of the small doc times 20cm high. That's 4cm in the scrollbar. So it would take 464 ms. For 4 pages, it would take 634 ms and for 8 pages 817 ms.
   In the large doc would be 20cm/100 pages ->1/5 cm there are 5 pages so 1cm. 317 ms. With 25 pages 517 ms. And with 50 pages 692 ms

2. For small document scrolling tasks (2, 4, and 8 pages), paging using flicking gestures is likely to be faster because the touch and release time for the scrollbar may add up.For large document scrolling tasks (5, 25, and 50 pages), it's possible that paging with flicking gestures is still faster due to the cumulative time spent pointing and touching the scrollbar for precise positioning. In conclusion, for quick and relatively short scrolling tasks, paging with flicking gestures may be more efficient. However, the efficiency of the scrollbar method may improve if the user becomes skilled at quickly targeting the scrollbar and elevator. The choice between the two methods may also depend on user preferences and habits.

3. Direct Scrolling
   A. In direct scrolling, the scrolling speed is directly related to the initial speed at which the user moves their finger. This means that by scrolling quickly, the user can cover a significant number of pages without the need for additional input.
   At high speed, the user can achieve a quick initial scroll, which allows the document to continue scrolling on its own.
   The 10-page limit in 4 seconds is substantial, and the time saved by not waiting for the scrolling to stop can be significant when compared to slower scrolling speeds.
   Therefore, for distant pages, it's more efficient to initiate scrolling at a high speed and let the document continue to scroll without waiting for it to stop.
   B. In the small document:
   2 pages at high speed. 1 second for the first 5 pages. Same for 4 pages
   For 8 pages. 1 second for 5 pages + 1 second for the next 3 pages
   In the large document: 1 second for 5 pages, 9 seconds for 25 and 20 seconds for 50 pages
4. Tables
   A.

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
Distance/ Num pages	2/10	4/10	8/10	5/100	25/100	50/100
ID	1,6	2,3	3,2	2,6	4,7	5,7
MT (scrollbar)	1156ms	1326ms	1509ms	1009ms	1209ms	1384ms
MT(paging)	400ms	800ms	1600ms	1200ms	5200ms	10200ms
MT(direct scrolling)	1000ms	1000ms	2000ms	1000ms	9000ms	20000ms

We can see that time rises as there are more pages because the difficulty also augments.

B. For quick and relatively simple scrolling tasks (low to moderate difficulty), both direct scrolling and the other two techniques (scrollbar and paging) seem to perform similarly. Direct scrolling can be advantageous for tasks with higher difficulty (higher ID values) where it appears to outperform the other techniques, especially for larger documents with more pages.