projection is the one for which the subsequence $a_1, a_3, \ldots, a_{2n-1}$ is minimal in lexicographic order. The standard sequences corresponding to the knot projections with up to 5 crossings are determined by the subsequences:

$$4\,6\,2, \quad 4\,6\,8\,2, \quad 4\,8\,10\,2\,6, \quad 6\,8\,10\,2\,4.$$

Now let S be any sequence $a_1, a_2, \ldots, a_{2n}$, such that $a: i \to a_i$ is a parity reversing involution of $\{1, 2, \ldots, 2n\}$. Our main aim in this paper is to find out which sequences of this kind correspond to knot projections. This will enable us to use a computer to tabulate knot projections, and eventually to tabulate knots.

Here we should state that there are several solutions in the literature to Gauss's "crossing sequence problem", which is equivalent to our problem of deciding which sequences S correspond to knot projections in the plane (see [4, 5, 6]). However, we develop an alternative approach which is very elementary in nature, and which leads to a simple and efficient algorithm suitable for the computer enumeration of large numbers of knot projections.

Let $[i, j]$ denote the interval $\{i, i+1, \ldots, j\}$ of integers mod $2n$. Let the sequence S correspond to a projection of a knot K. If an interval $[i, i+1] \bmod 2n$ with only two elements were mapped onto itself by a, i.e. if $a_i = i+1 \pmod{2n}$, the projection would be immediately reducible to one with $n-1$ crossings. Thus adjacent numbers $i, i+1 \pmod{2n}$ cannot be interchanged by the involution a. It follows that n cannot be 1 or 2. If K can be projected with no crossings, it is regarded as unknotted. Thus S cannot be the trivial sequence for which $n = 0$.

If there is a proper subinterval $[i, j] \bmod 2n$ of $\{1, 2, \ldots, 2n\}$ which is mapped onto itself by a, the complementary interval $[j+1, i-1] \bmod 2n$ is also mapped onto itself. Each of these intervals has an even number of elements. As we have seen, if S comes from a projection of K, neither interval has two elements. Moreover, if an interval with four elements were mapped onto itself, two adjacent numbers mod $2n$ would be interchanged, which is not possible. Hence K is the composite of two knots each with at least three crossings. When tabulating knots one usually omits composite knots. This justifies imposing the following restrictions on the sequences to be used when tabulating knots or knot projections.

Rule 1. *The sequence $a_1, \ldots, a_{2n}$ is to satisfy*:

(i) $n \geqslant 3$;

(ii) *no proper subinterval* $[i, j] \bmod 2n$ *of* $\{1, 2, \ldots, 2n\}$ *is mapped onto itself by the involution* $a: k \to a_k$.

There are $2n(2n-1)$ proper subintervals mod $2n$ of $\{1, 2, \ldots, 2n\}$ with even numbers of elements, but each is the complement of another. Each is mapped onto itself if and only if it is mapped into itself. To check whether a given sequence S satisfies Rule 1, it is sufficient to check $n(n-1)$ intervals mod $2n$, each having at most n elements, or to check the $n(n-1)$ proper subintervals of $[1, 2n]$ not containing $2n$.