Table 1 also shows that for seven of the twelve stars the latitude deviations $|B_i(t) - b_i|$ are more than $10'$ for all t from the a priori time interval. ($10'$ is the accuracy claimed by the compiler of the Almagest.) For the star 510 (Spica), the following inequality holds:

$$\max_{1 \leqslant t \leqslant 21} |B_{510}(t) - b_{510}| < 10'.$$

For another four stars, no more than two stars are contained in a 10-minute interval. And this is true for all t!

This fact is particularly surprising since it is valid for the *bright, named* (*i.e., well-known*) *stars*, the very ones whose coordinates must have been measured most carefully by the ancient astronomer. We conclude that the Almagest star catalogue must contain some *systematic errors*.

In the next sections, we shall try to realize two main objectives: (a) to calculate all *systematic errors* in the Almagest, and (after removing these systematic errors from the stars' coordinates) (b) to calculate some *time interval* spanning the actual time of observation. As was shown by the preceding calculations, we can determine only the *time interval*, not the "exact point of minimum".

6. General Description of the Method of Dating

6.1. Types of errors occurring in the catalogues. We have shown that all attempts to calculate the *exact point* of minimum of a particular distance between modern star configurations and those of the Almagest fail. As pointed out above, errors in the coordinates of individual Almagest stars are great in comparison with the velocities of proper motions of most fast, bright stars. So we must examine very carefully all possible errors in the catalogues. We divide these errors into three types: *systematic errors, random errors,* and *spikes*.

Systematic errors appear as a result of global measurements or recalculations of coordinates which induced the global rigid translation (motion, shift) of the stars on the total celestial sphere (or on a significant part of it). Such systematic errors do occur in the Almagest (see below).

Random errors are the result of a lack of exactness of individual measurements attributable to the use of imprecise instruments. Errors of this kind cause a random movement of each star on the celestial sphere. It is reasonable to assume that these errors have random distribution with zero mean value. Such errors usually do not exceed the size of the scale unit (of the instrument).

Spikes are caused by circumstances beyond the control of the observer and unknown to him—for example, the errors of later copyists, refraction, etc. These errors usually change the coordinates only of single stars; their values are likely to be considerably larger than the unit scale of the instrument and occur rarely.

6.2. Systematic errors. Systematic errors are most frequently introduced by the recalculation of equatorial coordinates into ecliptical ones. Such recalculation is inevitable, since all astronomical instruments are based on the earth and initially are correlated with the equatorial coordinate system. The transition to the ecliptical system was accomplished with the aid of mathematical formulas, special globes, or