

In addition, the phase difference method can also be simulated in MATLAB. The simulation results are shown in Fig. 6.

From the previous discussion, it can be seen that although the direct time difference method has the advantage of wide detection range, it can be used to detect the propagation time of sound. But it has the disadvantage of low detection accuracy. Although the phase difference method has the advantage of high accuracy in detecting sound propagation time, it has the disadvantage of narrow detection range. The integer-decimal detection algorithm based on FPGA can detect propagation time and overcome the shortcomings of both, retaining the advantages of both. The phase resolution is 0.007 degrees, and the accuracy of acoustic time measurement is better than 1 ns. It is easy to integrate, low cost and easy to implement. It is a good detection technology.

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