INTRODUCTION TO RADAR SYSTEMS

UNIT–III

Lecture–4

Tracking in Range

- In most tracking-radar applications the target is continuously tracked in range as well as in angle.
- Range tracking might be accomplished by a human operator who watches an A-scope or J-scope presentation and manually positions a hand wheel in order to maintain a marker over the desired target pip.

Contd.

- In pure displacement tracking, the turns of the handwheel are made proportional to the displacement of the target.
- If the target's range changes at a constant rate, operator must turn his handwheel at a constant rate.
- If he is lagging behind the target, he will turn faster until error is corrected, if he is leading the target, he will turn more slowly.

Contd.

- Displacement and rate tracking may be combined so that the handwheel position automatically corrects for speed at the same time that the displacement error is corrected.
- This is called aided tracking. Aided tracking may also be used for manual tracking in angle as well as range.

Contd.

- The technique for automatically tracking in range is based on the split range gate.
- Two range gates are generated. One is the early gate, and the other is the late gate. The relative position of the gates at a particular instant and the error signal.
- The portion of the signal energy contained in the early gate is less than that in the late gate.

Contd.

- When tracking a target moving with constant velocity the handwheel need not be turned once the proper adjustment has been made.
- As target speeds increase, it is increasingly difficult for an operator to perform at the necessary levels of efficiency over a sustained period of time, and automatic tracking becomes a necessity.

Contd.

- The range gating necessary to perform automatic tracking offers several advantages as by-products.
- It isolates one target, excluding targets at other ranges. This permits the boxcar generator to be employed. Also, range gating improves the signal-to-noise ratio since it eliminates the noise from the other range intervals.

Contd.

- A target of finite length can cause noise in range-tracking circuits in an analogous manner to angle-fluctuation noise (glint) in the angle-tracking circuits. Range tracking noise depends on the length of the target and its shape.
- It has been reported that the rms value of the range noise is approximately 0.8 of the target length when tracking is accomplished with a video split-range-gate error detector.

Contd.

- If the outputs of the two gates are subtracted, an error signal will result which may be used to reposition the center of the gates.
- The setting of the hand wheel is a measure of the target range and may be converted to a voltage that is supplied to a data processor.
- Hence the width of the gate should be sufficiently narrow to minimize extraneous noise.