



Marwadi
education foundation

Surveying

A Presentation On

Plane Table Survey

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**KNOWLEDGE IS THE CURRENCY
FOR THE 21st CENTURY**

PRESENTATION OUTLINE...

- Plane Table Surveying
- Accessory used in Plane Table Survey
- Merits
- Demerits
- Principle of Plane Table Survey
- Setting Up the Plane Table

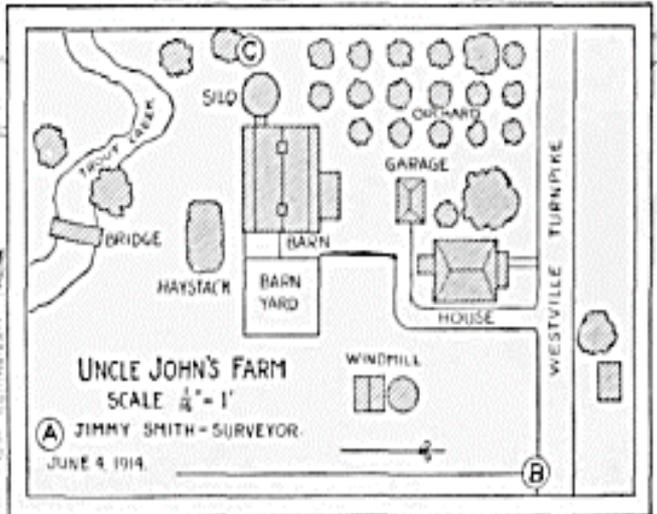
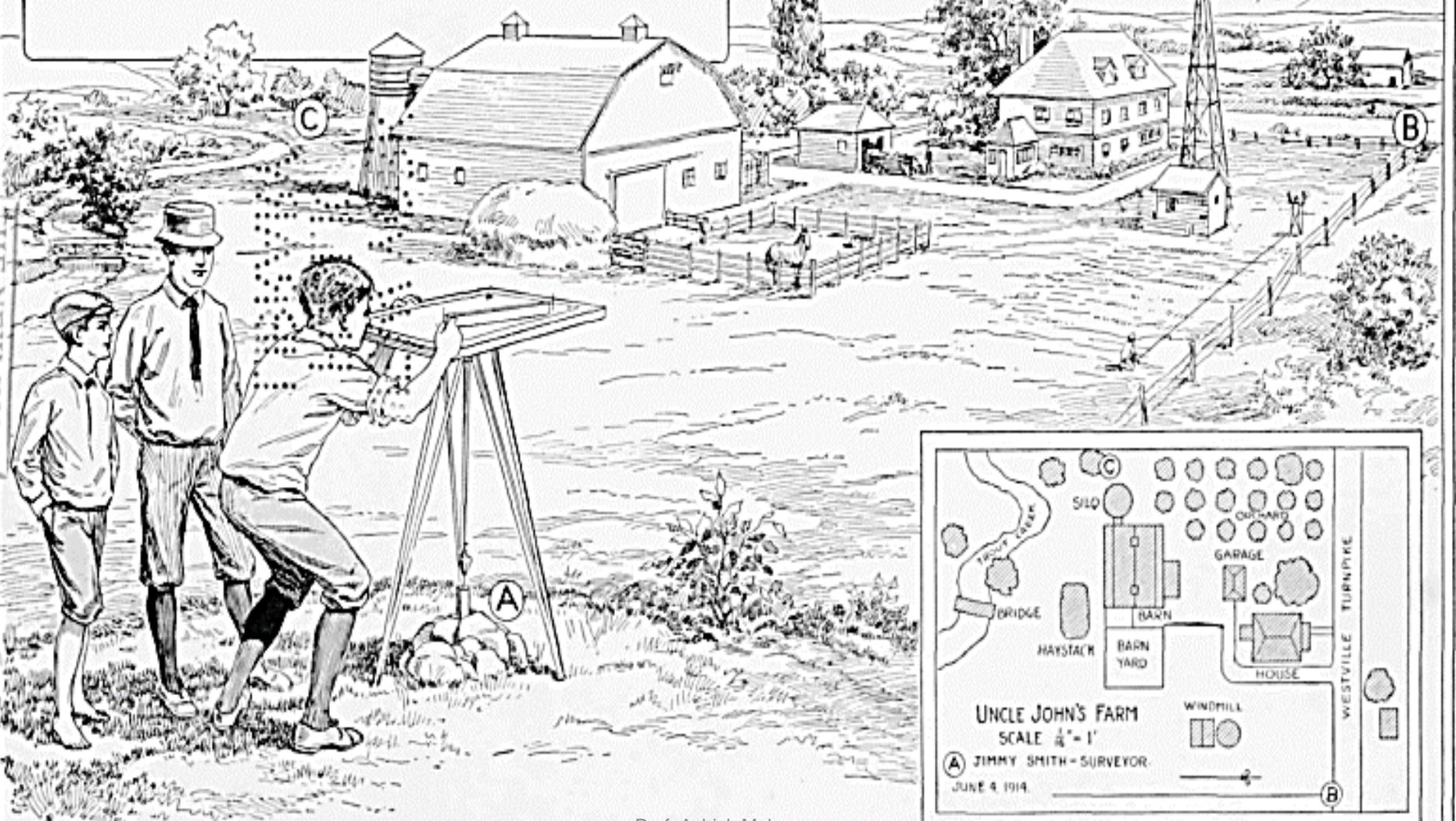
PRESENTATION OUTLINE...

- Methods of Orientation
- Method of Radiation
- Method of Intersection
- Method of Traversing
- Method of Resection
- Points to be kept in mind in Plane Table

Plane Table Surveying

- Plane table is a graphical method of surveying in which the field works and the plotting is done simultaneously. It is particularly adopting in small mapping. Plane table surveying is used for locating the field computation of area of field.

After the First Station has been Selected, It is Marked by a Pile of Stones, a Stake, or, If Precise Work is to be Done, a Tack in the Top of a Stake. The Table is Then Set Up over This Station Point and Leveled So That the Surface of the Paper will Be Truly Horizontal and Leveled So That the Surface of the Paper will Be Truly Horizontal



ACCESSARY USED IN PLANE TABLE SURVEY

Plane table essentially consist of:

- Drawing board mounted on tripod.
- Alidade.
- Tripod
- Sprit Level
- Plumbing Fork
- Drawing Sheet

Drawing board mounted on tripod

- A sheet of drawing paper, called plane table sheet is fastened to the board. Board is made up of well seasoned wood such as teak of size 40x30 to 75x60cm.
- it had plane and smooth top. It is mounted on a tripod in manner that it can be leveled. Leveling up of the table is done by shifting the legs of tripod.
- Some tripod provided with leveling screw or by ball and socket head for accurate leveling.

Alidade

- Alidade consists of two vertical sight vane fitted at end the end of straightedge. The straight edge ruler usually made of brass or teak wood graduated beloved edge.
- One of the sight veins is provided with narrow slit and the other with a central vertical wire or hair. Beveled working edge alidade is called Fiducial edge.



An early model Alidade

Measurements with the Alidade and Stadia Rod

❖ Setup of the instrument includes:

1. Leveling the plane table
2. Drawing magnetic north reference line.
3. Measuring the instrument height.
4. Recording of scale (ensure all features to be mapped will fit on map).
5. Recording of ground elevation directly below the center of the plane table.

Plane Table and Alidade



Accessories

- A through compass for marking the direction magnetic meridian on paper.
- Spirit level for leveling the table.
- Forked plumb for centering the table.
- Water proof cover to protect the sheet from rain.

Merits

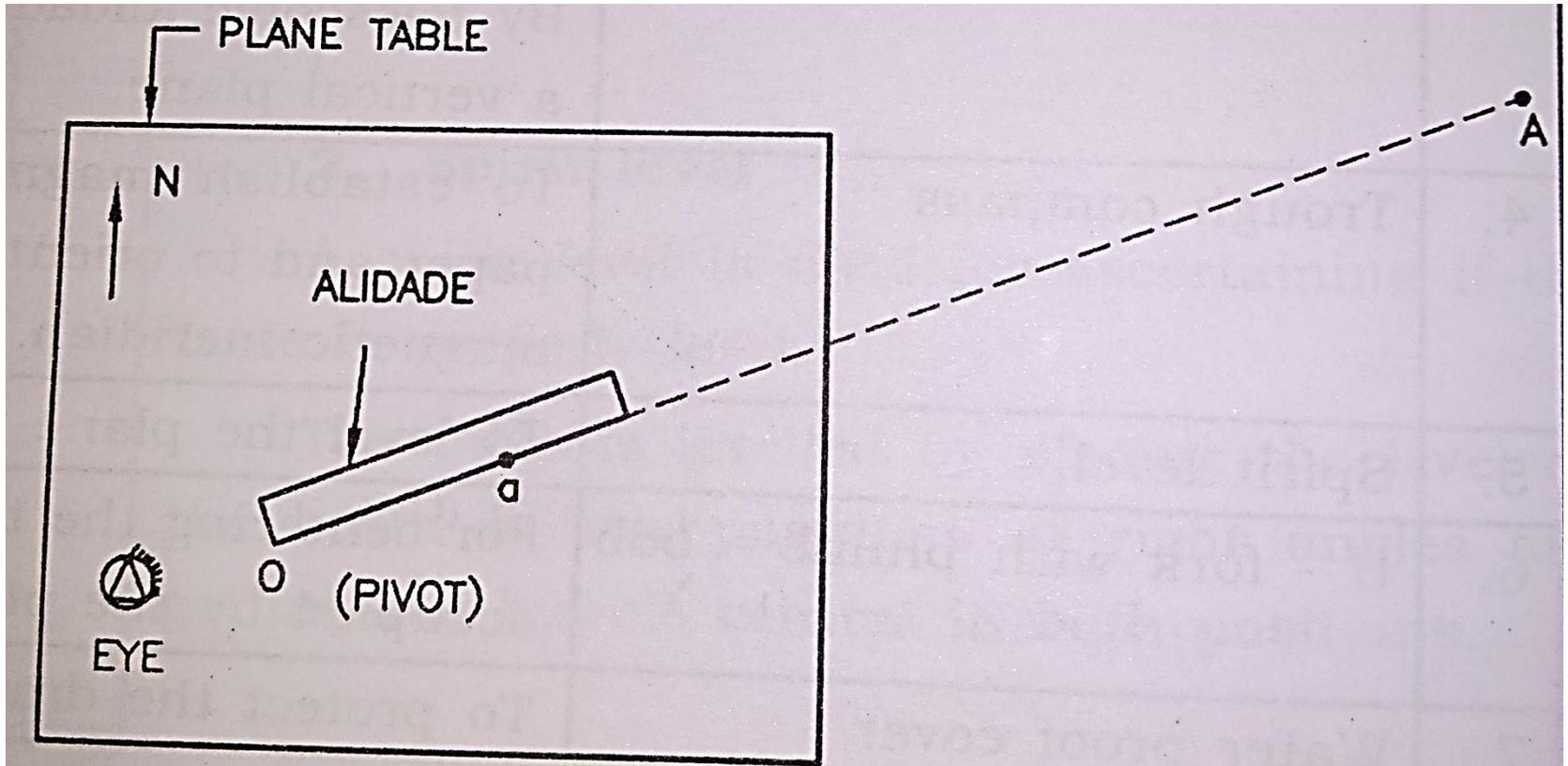
- It is most suitable for preparing small scale map or surveying small area.
- It is most rapid method.
- Field book is not necessary.
- No great skill is required for satisfactory map.
- It is particularly suitable for magnetic area where prismatic compass is not reliable.
- Contour and irregular object may be represented accurately.
- It is less costly.

Demerits

- Plane Table Essentially a tropical instruments.
- It is not suitable to work in wet climate.
- There are several accessories to be carried out and therefore they are likely to be lost.
- It is not suitable for accurate work.

Principle of plane table survey

- Principle: “All the rays drawn through various details should pass through the survey station.”
- The position of plane table at each survey station must be identical, i.e. At each survey station the table must be oriented in the direction of magnetic north.



Principle of Plane Table Survey

Principle of plane table survey...

- Fix the table on the tripod and level it. Transfer the survey station on the drawing paper as “O”.
- Now, place the alidade on the paper such that zero mark of alidade coincide with point “O” on the paper. This process is called pivoting.
- Pivoting the alidade about “O”. Rotate it to sight “A” on the ground. Draw ray oa.
- Measure distance OA on the ground and plot it along the ray to get a.

Principle of plane table survey...

- Normally, points O, A, B, C... etc. represents the points on the ground while the points o, a, b, c... etc. represents the points on the drawing paper.

SETTING UP THE PLANE TABLE

There are **four methods** of setting plane table:

- Centering
- Leveling
- Orientation

- **Centering**

- It is the process of keeping the table over the station that the point on the paper representing the station being occupied is vertically over the point on the ground. It is done by forked plumb bob.

Leveling

- Place the table over the station point and spread out legs to make it level and at convenient height, preferably, not above the elbow.
- The leveling is done by means of leveling screws and socket arrangement with reference to level tube placed in two position at right angles to each other.

Orientation

- When the table has to be set up at more than one station it is necessary that it is be oriented so that the lines on the paper remain parallel to the lie which they represent on the ground.
- So orientation is “the process of keeping the table to the position which is occupied at the first station”.

Methods of Orientation

- Orientation is done by two methods are as follows:
 1. By use of the magnetic needle.
 2. Orientation by back sighting.

Orientation by the magnetic needle

- To orient the table at any subsequent station, the through compass(or circular box compass) is placed along the line representing the magnetic meridian which has been drawn on the paper at the first station, and the board is then turned until the ends of the needle are opposite the zeros of the scale.
- The board is then clamped in position. It is suitable for rough small scale mapping.

Orientation by back sighting

- This is the most accurate method of orientation and is always be preferred. Suppose a table is set up over station Q on the line PQ which has been previously drawn as PQ from station p.
- The alidade is placed along the line QP and board then turned until the line of sight bisects the ranging rod at P. Board is then properly clamped.

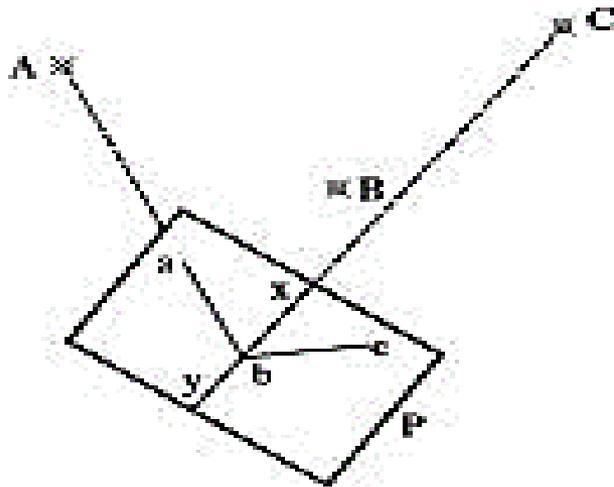
THREE POINT PROBLEM BY BESSEL METHOD

- Let P be the plane-table station and A, B, C be the three well defined ground points, which are represented as a, b, c , respectively on the plan. When resectors drawn through a, b , and c meet at a point p , then the table is said to be correctly oriented at P , giving the location of the plane-table station.
- This may be obtained using Bessel's graphical solution available in a number of sources.

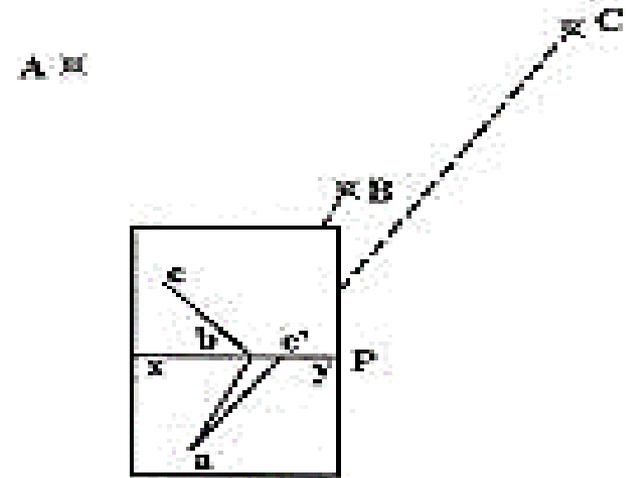
➤ The procedure is summarized as follows:

- Set the plane table at station P. Keep the edge of the alidade on the ba line and rotate the table until A is bisected. Clamp the table;
- Pivot the alidade about b and sight to C. Draw the ray xy along the edge of the alidade [?]Fig. 1(a).
- Keep the alidade along the ab line and rotate the table until B is bisected. Clamp the table.
- Pivot the alidade about a and sight to C. Draw the ray along the edge of the alidade to intersect the ray xy in c[?]Fig. 1(b). Join cc.

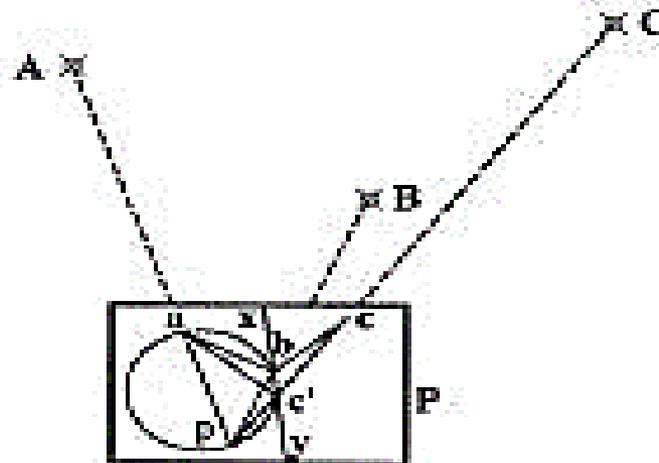
- Keep the alidade along the cc line and rotate the table until C is bisected. Clamp the table. The table is correctly oriented Fig. 1(c) and
- Pivot the alidade about b , sight to B . Draw the ray to intersect cc in p . Similarly, if the alidade is pivoted about a and A is sighted, the ray will pass through p if the work is accurate.



(a)



(b)



(c)

Advantages

- It is one of the most rapid methods of surveying.
- Checking of plotted details can be done easily.
- Office works is practically reduced to nil.
- Less costly as compared to other methods of surveying.
- Since notes of measurements are not recorded, it is great inconvenient to reproduce the map to another scale.

Disadvantages

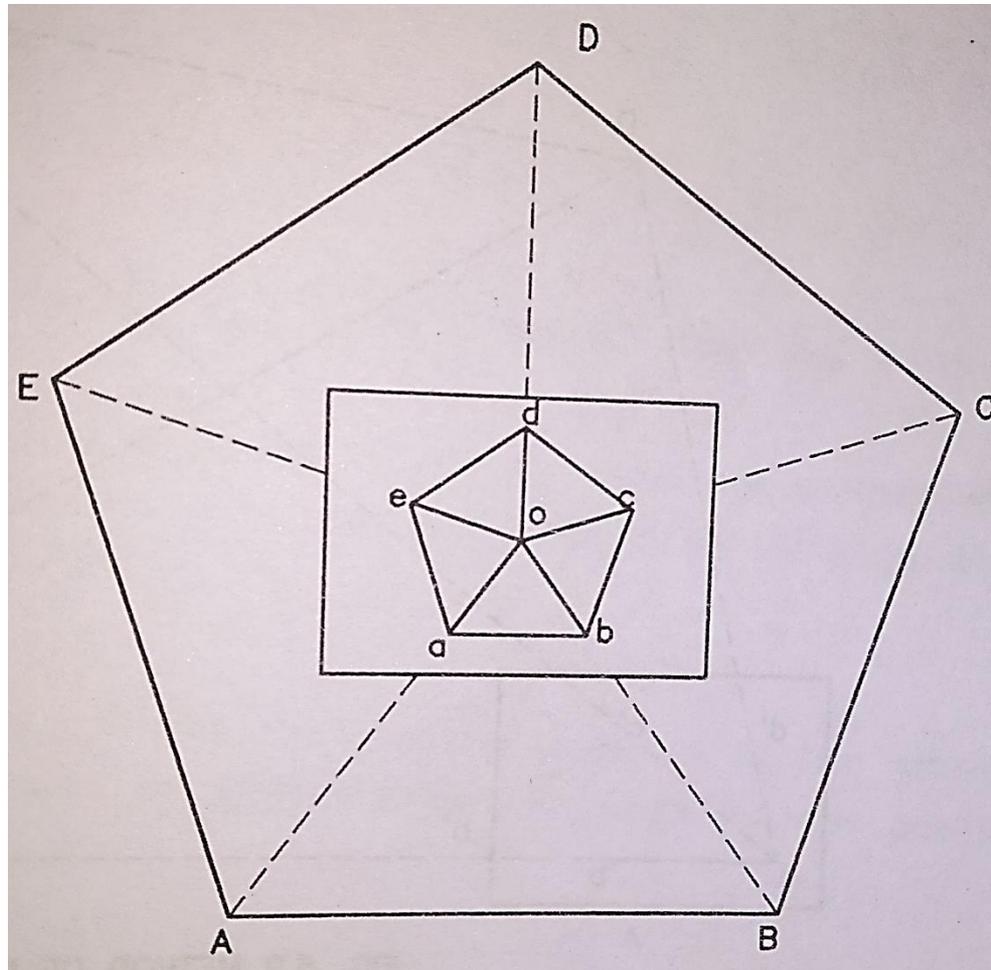
- It is not very accurate.
- It is inconvenient in rainy season or in wet climate.
- It requires many accessories on the field.
- Due to heaviness, it is inconvenient to transport.

METHOD OF PLANE TABLING

There are four distinct methods of plane tabling:

- Method of Radiation
- Method of Intersection
- Method of Traversing
- Method of Resection

Method of Radiation



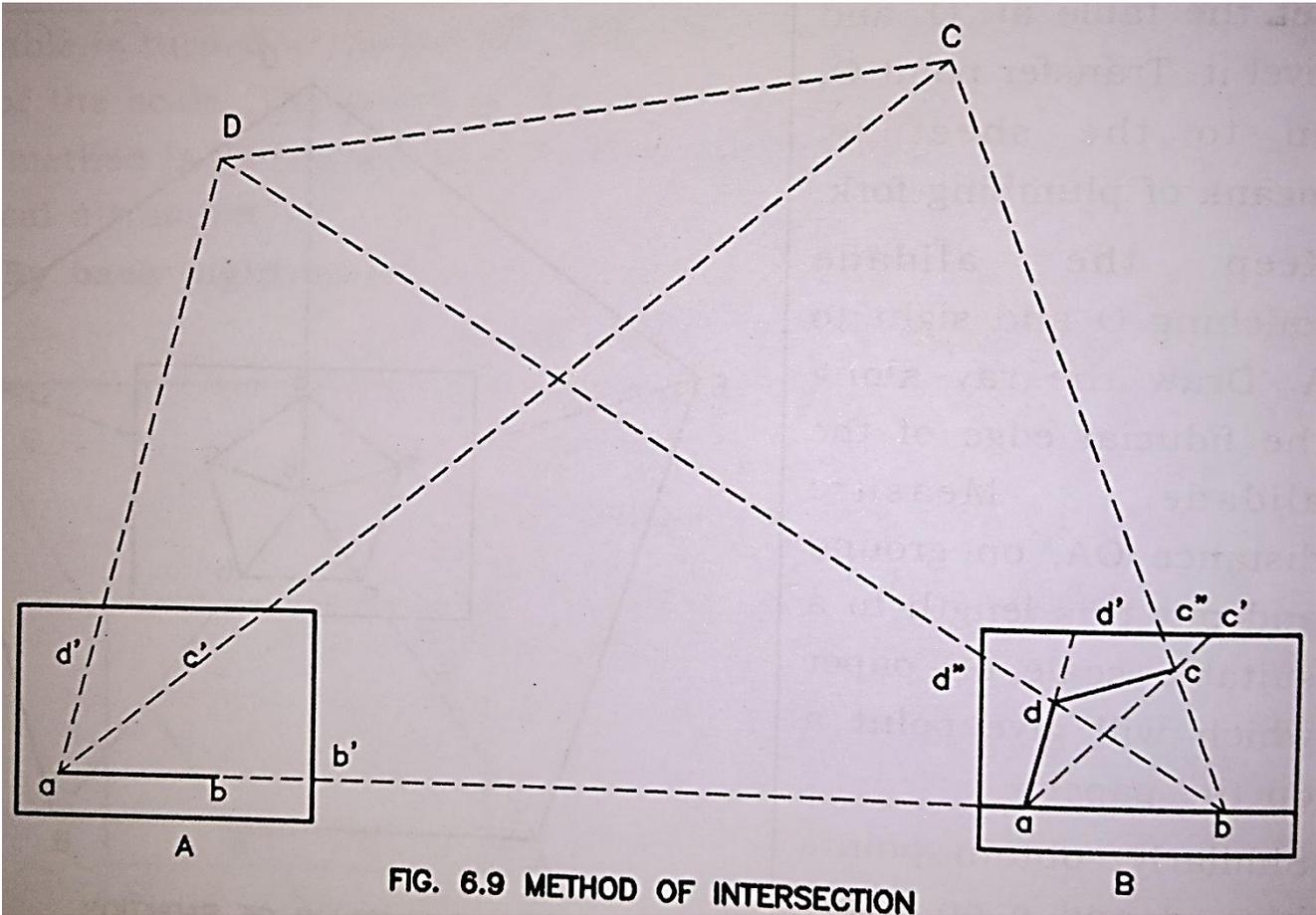
Method of Radiation

Method of Radiation:

- This is the simplest method and it is useful only when the whole traverse can be commanded from a single station.
- Set the table at 'O' and level it. Transfer point O, on to the sheet by means of plumbing fork.
- Keep the alidade touching O and sight to A. Draw the ray along the fiducial edge of the alidade. Measure distance OA, on ground and put this length to a suitable scale on paper which will give point a on the paper.

- Similarly, obtain points b, c, d and e on paper by drawing lines of sight for stations B, C, D and E and measuring the distances OB, OC, OD and OE on ground respectively.
- Join a, b, c, d and e on paper.
- For checking the accuracy of work, measure the distances AB, BC, CD, DE and EA and compare them with the lengths ab, bc, cd, de and ca respectively on paper.

Method of Intersection



Method of Intersection

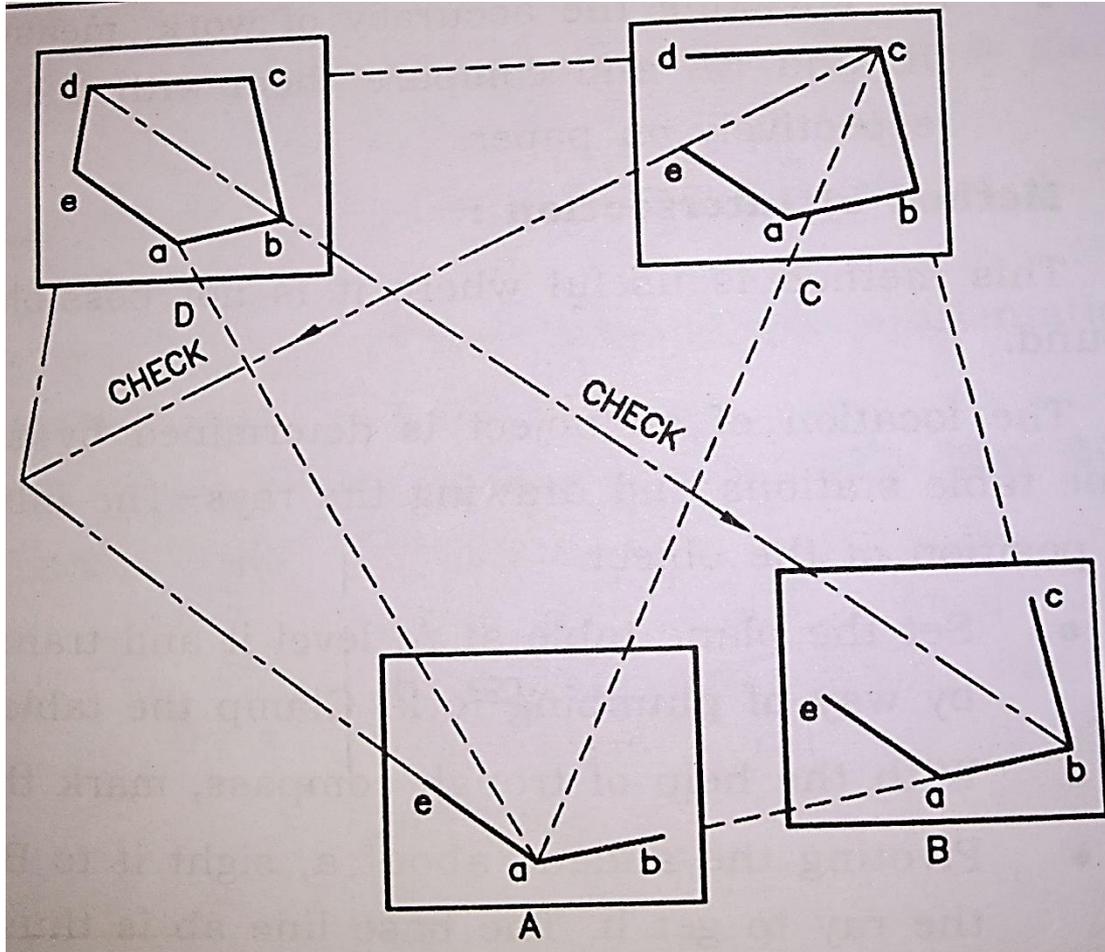
- **Method of Intersection:**

- This method is useful where it is not possible to measure the distances on ground.
- The location of an object is determined by sighting at the object from two plane table stations and drawing the rays. The intersection of these rays will give the position of the object.

- Set the plane table at A, level it and transfer the point A on to the sheet by way of plumbing fork. Clamp the table.
- With the help of trough compass, mark the north direction on the sheet.
- Pivoting the alidade about a, sight it to B. Measure AB and plot it along the ray to get b. The base line ab is thus drawn.
- Pivoting the alidade about a, sight the details C, D etc. and draw corresponding rays.

- Shift the table at B and set it there orient the table by back sighting A.
- Pivot the alidade about b, sight the details C, D etc. and draw the corresponding rays to intersect the previously drawn rays at c, d etc.
- Thus, the plot ABCD can be plotted on paper as abcd.

Method of Traversing



Method of Traversing

- **Method of Traversing**

- This method resembles the work of a compass survey and it is useful for the survey work of roads, rivers etc.
- Set the plane table at A. Use plumbing fork for transferring A on to the sheet. Draw the direction of magnetic meridian with the help of trough compass.
- With the alidade pivoted about a, sight it to B and draw the ray. Measure AB and scale of ab to some scale. Similarly, draw a ray towards E, measure AE and plot e.

Method of Traversing...

- Shift the table to B and set it. Orient the table accurately by back sighting A. clamp the table.
- Pivoting the alidade about b, sight to c. Measure BC and plot it on the drawn ray to some scale.
- Similarly, the table can be set at other stations and the traverse is completed. If there are n stations in a closed traverse, the table will have to be set on at least $(n - 1)$ stations to know the error of closure.

Method of Resection

- Resection is the process of determining the plotted position of the station occupied by the plane table, by means of sights taken towards known points, locations of which have been plotted.

There are four methods of resection:

- By compass
- By back sighting
- By two-point problem
- By three-point problem

- **By compass**
- This method is used only for small scale or rough mapping.
- Let A and B be two visible stations which have been plotted on the sheet as a and b. Let C be the instrument station to be located on the plan.
- Set the table at C and orient it with compass. Clamp the table.
- Pivoting the alidade about a, draw a ray (resector) towards A, aa'. Similarly, pivoting the alidade about b, draw a ray towards B, as bb'. The intersection of aa' and bb' will give point c on the paper.

- **Points to be kept in mind in Plane Table**
- The following points should be kept in mind while doing plane table survey.
 1. Ground points shall be marked as A, B, C ... etc. and plan points (on paper) shall be marked as a, b, c...etc.
 2. The rays from survey stations to the objects shall be drawn by dashed line.
 3. The alidade should be properly pivoted while sighting the objects.
 4. The first survey station and the scale of the map shall be so chosen that the entire area can be plotted on the paper.

Points to be kept in mind in Plane Table...

5. While establishing magnetic north on the paper using trough compass, things causing local attraction shall be kept away of the table.
6. The plane table should be clamped after centering and levelling. The table should be rotated only at the time of orientation.

- **Errors in Plane Tabling**

The various sources of errors are classified as:

1. Instrumental errors
2. Errors in manipulation and sighting
3. Errors in plotting

- 1. Instrumental errors**

- The surface of drawing boards is not plane.
- The edge of alidade is not straight.
- The object vane and sight vane are not perpendicular to the alidade.
- The edge of alidade is not parallel to the line of sight.
- The fixing clamp is not proper.

2. Errors in manipulation and sighting

- Defective levelling
- Defective sighting
- Defective orientation
- Defective centering
- Movement of board between sights

3. Errors in plotting

- Defective scale of map
- Wrongly intersecting the rays drawn from two different stations

THANK YOU