The Calibrated Bicycle Method :The "Senechalle Assembly"

A CABLE-DRIVEN BICYCLE ODOMETER by Dr.David Senechalle

When using the calibrated bicycle method for measuring road courses, one usually employs a revolution counter. There are,however,other types of bicycle odomters (measurer of distance traversed),not strictly revolution counters, which just as adequately meet the requirements: (a) that it measure small enough units of distance--say 2" or less; and (b) that it can be calibrated,i.e.,run over an accurately measured reference mile to obtain a constant for use on one measuring occasion. The following article describes one such device. It has several advantages over the typical (star wheel) revolution counter.

Materials Needed.

1.A resettable automobile trip odometer from: The J.C.Whitney & Co., 1917-19 Archer Avenue,Chicago,Illinois 60616. When not in use on a bicycle it may be used in an automobile and measures hundredths of miles. Therefore, order Catalog No.882710 for American cars and 88-2711 for Volkswagen. Shipping weight is 2 lbs,so include money for parcel post from Chicago. Postage: Local (Illinois & Indiana) 60¢; Zone 1 & 2 (parts of Ill.,Indiana,Iowa,Michigan,Wisconsin) 65¢;Zone 3 (parts of Ill.,Ind.,Iowa,Kentucky,Michigan,Missouri,Ohio,Wisconsin), and Zone 4,rest of country 75¢. The price of the trip odometer is $15.98. The difference between the two models is not in the odometer unit itself but in the accessory cable-splitting devices which you use on the car but not on the bicycle.

2.Buy a Huret bicycle cable and gear box . Do not buy the speedometer. Most bicycle stores are willing to order the cable and gear box if they do not have it in stock. Costs vary from $1.50 to about $3.50. These cables have a gear box at one end with the number 1.6 stamped on the casing. This means that the cable turns 1.6 turns for every turn of the wheel.

Installation.

4.Divide the front wheel into 32 equally-spaced units and paint the numbers on the rim of the wheel. They should increase as the wheel turns forward.

Techniques of Measurement.

As the bicycle rolls forward,the numbers in the odometer window change gradually at the rate of 1 unit for every 17/32 revolution of the wheel. It is important to be able to associate a specified number of units with a definite position of the bicycle. A slight amount of arithmetic is necessary in order to accomplish this. In order to explain the technique,the following terms are used: Wheel units--The front wheel is divided into 32 units, equally spaced. There should be a line and a number painted on the rim to identify each one. Odometer units--One odometer unit equals 17 wheel units. Thus if the wheel and odometer start at 0, the odometer will register 1 when the wheel is at 17, 2 when when the wheel is at 2,3 when the wheel is at 19,etc.

Problem: Measure n odometer units and w wheel units from a given point.

Solution:Start at the given point with the odometer and wheel at 0. (The 0 point on the wheel should be on top of the starting point.) Advance until the number n is in the window of the odometer. Now only a minor adjustment of the wheel is necessary. To accomplish this, multiply 17 times n, divide 32 into the result and let k be the remaindor. (A short cut is explained below.) Now move the wheel a

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p.2 slight amount, usually backwards about 4 wheel units, until the wheel is set at k. Move the bicycle w wheel units forward and the axle of the front wheel is now at the desired point.

Short cut for calculation. The long way is to divide 32 into 17 times n and get the remainder. The following method is easier: If n is even, just divide 32 into n and let k be the remainder. If n is odd, divide 32 into n. If the remainder is 15 or less, add 16 to it. If it is 17 or more, subtract 16 from it. Let k be the result.

Examples:

1.Measure 542 odometer units plus 10 wheel units. Dividing 32 into 542 (which is even) we get a remainder of 30. Ride until the odometer reads 542 and the wheel is at 30. Now move the wheel forward to 8.

2.Measure 551 odometer units plus 16 wheel units. Dividing 32 into 551, we get a remainder of 7, so add 16 and obtain 23. Ride until the odometer is at 551 and the wheel is at 23. Now move the wheel forward to 7.

3.To go 2459 odometer units plus 10 wheel units. Dividing 32 into 2459, we get a remainder of 27, so subtract 16 and obtain 11 as the result. Ride until the odometer is at 2459 and the wheel is at 11. Move the wheel forward to 21.

Problem: Determine the number of odometer units plus the number of wheel units between two points A and B.

Solution: Start at A with the odometer and wheel at 0. Ride toward B. Stop just before B with a number n centered in the odometer window. Use the techniques explained above to place the wheel at a point exactly n odometer units from A. Now determine the number w of additional wheel units to B. The distance between A and B is n odometer units plus w wheel units. Of course, if k is larger than 17, you can subtract 17 from it and add 1 to n.

ADVANTAGES OF THIS ASSEMBLY:

1.Reliability. The cable-type set up is extremely reliable. It can be used riding full speed down large hills, without malfunctioning.

2.Ease of use. The counter can be reset to 0 and it mounts on the handlebars for easy viewing while riding. If it is necessary to remove the front wheel for transportation of the bicycle,no delicate adjustments are necessary to reconnect the device.

3.An automobile odometer. When not in use on the bicycle,the odometer can be returned to its intended use, on a car. It is accurate to 1/100 of a mile. Whitney includes all the attachments for hooking it up. It even lights up with the rest of the instrument panel. It can be used for laying out practice courses after the automobile has been calibrated on an accurately measured course.

4.Availability. Anybody can buy these devices, one at a time at retail prices.

DISADVANTAGES:

1.A little bit of arithmetic is required in order to obtain the exact wheel placement for a given number of odometer units. If the device counted revolutions instead of 17/32 revolutions,the calculations would be eliminated. However, the process becomes very simple after a little bit of practice and errors can be discovered if accurate field notes are maintained.

2.The plastic knob on the reset shaft tends to vibrate loose.If this happens,replace it with a piece of wooden dowel with a small hole for the shaft and a perpendicular hole for a reset screw. This type of knob will not vibrate loose.

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NOTES--

*The Road Calibration Course should be one mile long, but may be 1/2 mile long if necessary. It must be on a paved,level,straight,lightly travelled road. It must be carefully measured at least twice with a good steel tape and the average of the measurements taken as the standard distance.The start and finish should then be permanently marked.Ride over the calibration course at least 4 times before measuring the race course and twice after the course measurement.
*Be sure to practice the method,including the arithmetic,before measuring a race course.