4. DATA REDUCTION AND ANALYSIS

4.1 THE COMPUTER VEHICLE CLASSIFICATION AND REDUCTION SYSTEM (CVCRS)

The CVCRS is a PC-based system designed to assist in the collection of detailed vehicle classification, length and axle spacing from video tapes of the traffic stream. The video tape of the traffic stream taken from the utility pole off the side of the roadway (the pole camera - see Figure 21) is displayed on a second monitor connected to a video processor card in the PC. The video is paused by the user when a vehicle enters the test area. The locations of the front and back bumpers, and the axles are then entered using the mouse on the PC and a crosshair displayed on the monitor. The software calculates the overall length of the vehicle and the axle spacings, and then makes an initial estimate of the vehicle's classification. The user has the option of accepting or modifying the classification of the vehicle based on the FHWA guidelines for vehicle classes. The CVCRS also reads the time recorded on the videotape and time stamps the vehicle recorded for comparison with the data from the vendor's classifiers. Calibration of the CVCRS system length measurements is done using a 40 foot box marked on the pavement and a calibration routine in software which accounts for the camera angle and distance.

4.1.1 Hardware

The CVCRS hardware includes a video cassette recorder (VCR), a personal computer with mouse (PC), a Data Translation DT3851A-1 Flexible Frame Processor (PC video card), and a second VGA monitor. A picture of the CVCRS hardware is shown in Figure 22. The PC video card is installed in the PC and receives input from the VCR (lower right). The PC video card displays the video on the second VGA monitor (right of the PC) along with a crosshair cursor used to make measurements. Use of the video card allows the overlay of the crosshair cursor and automatic measurement of vehicle lengths and spacings by simply pointing and clicking with the mouse. The software required to operate the video card and record the vehicle data is installed an run on the PC.

The monitor and VCR shown on the left in Figure 22 is used for monitoring lane changes within the test site. The process used to handle vehicles which change lanes within the test site will be discussed below in Section 4.2.

4.1.2 Software

Custom software was written to setup and operate the CVCRS hardware. The primary purposes of the software were to operate the Data Translation PC video card, calibrate the length measurements, assist in the measurement of vehicle lengths and axle spacings, record the time at which the vehicle entered the test site, and make an initial guess of the vehicle class. The software ("CVCRS.c") was written using the C language and the Microsoft C compiler.

Figure 22. The CVCRS System

As the data reduction proceeded continual modifications were made to the software to improve its efficiency. For instance, a character recognition algorithm was added to the software after the data reduction from the first 48-hour test. The character recognition algorithm records time directly from the time displayed on the video screen saving the user the effort to increment (or enter) the time. This saved the user approximately 20-25% of the time required to enter each vehicle. Also, the five days of the second test not used for detailed vehicle-by-vehicle comparison did not need measurement of vehicle lengths and axle spacings. Therefore, a second version of the program ("CVCRS2.c") was made which simply recorded the time from the video, and saved the vehicle class and number of axles entered by the user. The second version of the software allowed the user to record vehicle data at nearly twice the rate of the original software.

The typical steps required to operate the CVCRS for detailed vehicle-by-vehicle data reduction are as follows:

1. Turn on the PC, change to the data reduction directory, and type "CVCRS <return>". Enter the file name for storing the data at the prompt "Enter Work File Name:".

2. Turn on the VCR and second monitor, insert a pole camera tape, and hit PLAY on the VCR.

3. When the CVCRS reaches the main screen (showing menu options at the top of the screen and vehicle data at the bottom), hit PAUSE on the VCR.

4. Select "Calibrate" on the CVCRS main screen. Follow the instructions to enter the four corners of the calibration box on the pavement, and enter the length of the calibration box (40 feet in this test).

5. Record each vehicle using the following steps:

   a. Advance VCR tape and PAUSE when a vehicle is on screen.

   b. Click the right mouse button to make a crosshair cursor appear on the second VGA monitor superimposed on the video image.

   c. Align the vertical bar of the crosshair with the front of the vehicle and click the left mouse button (position of the horizontal bar is unimportant).

   d. Align the crosshair vertical bar with the center of the first axle, align the horizontal crossbar with the bottom of the tire, and click the left mouse button. Repeat this step for each successive axle.

   e. Align the vertical bar of the crosshair of the rear of the vehicle and click the left mouse button.

   f. Click the right mouse button to exit the vehicle data entry and return the cursor to the main CVCRS screen. The program will automatically read the time from the tape.

6. If an error is made in the vehicle entry, exit the data entry screen (click right mouse button), select "Re-Enter Vehicle" from the main menu, and repeat step 5.

7. If the vehicle is longer than a full screen, then use the following steps:

   a. Pause the tape with the front bumper and at least half the vehicle displayed on the monitor.

b. Enter all of the points described in step 5 that are displayed on the screen, but DO NOT exit the data entry screen.

c. Choose a distinct vehicle feature (mark, reflector, axle, etc.) behind the middle of the vehicle, align the vertical bar of the crosshair with the selected feature, and hit "r" on the keyboard.

d. Advance the VCR tape and pause it such that the rear of the vehicle and the feature chosen in step 7c are both on the screen.

e. Align the vertical bar of the crosshair with the feature selected in step 7c and again hit "r" on the keyboard.

f. Finish entering axles and the rear of the vehicle as described in step 5.

8. Upon returning to the main menu, the user verifies the vehicle classification guess made by the program and the time recorded from the video. Either of these items can be changed by clicking on the appropriate selection in the middle of the main screen.

9. The data is saved using the "Save Data" option at the top of the main menu.

The steps required to operate the CVCRS2 program for less detailed data analysis are similar, but less complicated than those required to run the CVCRS program. Steps 1 through 3 and 9 are identical, but steps 4 through 8 are replaced by:

4. Advance the tape until the vehicle is centered on the screen.

5. Enter the vehicle class and number of axles using the keyboard.

6. Select "Re-enter Vehicle" on the main menu if an error is made, and repeat steps 4 and 5.

7. Verify time recorded by the program and edit if necessary.

8. Hit <Enter> or <Return> on the keyboard to start next vehicle.

4.2 HANDLING LANE CHANGES

The use of the long (600 foot) test site meant that a significant number of vehicles changed lanes within the site. A vehicle changing lanes will only be recorded by classifiers over which it passed, and can cause errors in those classifiers which it passed over while changing lanes. Also, if the vehicle entered the test lane after passing the pole camera, it would not appear in the ground truth data. Therefore, all vehicles that changed lanes within the test site were removed from the ground truth data for detailed vehicle-by-vehicle comparison (48-hour tests). Those which entered the test site after the pole camera were already not included in the ground truth data. The program for aligning and comparing ground truth data to classifier data ignored all vehicles in the classifier's data which did not have an appropriate match (in time) in the ground truth data.

The vehicles which changed lanes were identified using the video tapes from the lane change camera located on the overpass at the end of the test site. The tapes were viewed on a VCR and monitor (left side of Figure 22) an the time and class of each vehicle that changed lanes was manually recorded. The classifier over which the vehicle began and ended its lane change, and the direction of the lane change (in, out, both) was also recorded. Lines were drawn on the monitor screen to identify the locations of the classifier's sensors to enable the user to locate the classifier locations when viewing night time footage of the video tapes. The vehicles identified as leaving the test lane after the video monitoring area (pole camera) were manually removed from the ground truth data for the detailed analysis of the 48-hour test data.

For the long term statistics of the 7-day test, the lane changes were ignored. It was impractical to try to identify and remove lane changing vehicles from the classifier's binned data. The problems with removing the vehicles included identifying the particular classifiers for which the vehicle needed to be removed, and determining the effects of vehicle which had partially changed lane when passing over the classifier's sensors.

A review of the number of lane changes in a typical day (in the first 48-hour test) revealed the following:

1. Number of vehicles leaving the test lane = 384.

2. Number of vehicles entering the test lane = 408.

3. Number of vehicles which both entered and left the test lane = 90.

The number of vehicles entering and leaving the test lane are nearly equal, and the number of vehicle entering and leaving the test lane was relatively small. The ADT for the first test was approximately 9700 vehicles and the total number of vehicles which changed lanes was 882. Therefore, the percentage of vehicles which changed lanes was approximately 9.2%.

4.3 THE STANDARD DATA FORMAT

To reduce the number of programs required to handle the different storage formats of the classifier vendors, the detailed vehicle-by-vehicle classification and measurement data was converted to a standard format. Simple conversion programs were written by GTRI for each vendor data format which would convert it to the standard data format. The ground truth data was also converted to the standard format. The standard format files were used as the input for the "Binned" and "Analyze" programs described in the next two sections.

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Line Format:

MM-DD-YY__HHMMSS_CC_B_VVV.V_LL.LL_AA.AA__X_aa.aa_bb.bb_cc.cc_...

where      MM-DD-YY  = date (month - day - year),
           HHMMSS    = vehicle time where
                HH   = hour (24 hour clock),
                MM   = minute and
                SS   = second,
           CC        = vehicle class (13 FHWA classes),
           B         = vehicle subclass,
           VVV.V     = vehicle speed in MPH,
           LL.LL     = overall vehicle length in feet,
           AA.AA     = vehicle wheelbase in feet,
           X         = number of axles,
           aa.aa     = axle spacing between axles 1 and 2 in feet,
           bb.bb     = axle spacing between axles 2 and 3 in feet,
           cc.cc     = axle spacing between axles 3 and 4 in feet,
                .
                .
                .
```

Figure 23. The Standard Data Format

The standard data format is shown in Figure 23. Note that not all vendors have all the information required for the standard format, and the ground truth (or tape) data does not include vehicle speed. A pound symbol ("#") was used in those fields in the standard data format for which there was no data. For the case where the data for a particular field is normally provided by the classifier, but due to an error or other cause is not provided for a particular vehicle, a dollar symbol ("$") is used as a place holder. Vehicle subclass refers to the configuration of the axles on the trailer units within a vehicle class. Vehicle subclass was not used in the analysis of the data for this effort.

4.4 THE "BINNED" PROGRAM

The program "BINNED.c" was written in C, and is designed to transform vehicle-by-vehicle data files in the standard format to files in which the vehicle classes and axles are summed over a given interval (bin). Typically, the bin size is 15 minutes. The output of the BINNED program is a file showing the number of vehicles, the number of axles, and the number of vehicles in each vehicle class for each interval. Also, the program outputs the percentage of vehicles with greater than 2 axles in each interval and daily summaries.

When run, the program prompts the user for the name of the input file (in the standard format), the output file name and the time interval over which to bin the data.

The program then informs the user of the start time of the input file and prompts the user to input the time to start the binning. The start time input by the user is primarily used to get the program to bin at even times such as every quarter hour. The start time is assumed to be for the same day. If the user enters a start time before the input file start time, the output file will contain all zeros for those intervals before the interval containing the first vehicle in the input file.

The BINNED program was the primary analysis software for comparing the long term statistics of the data from the 7-day test.

4.5 THE "ANALYZE" PROGRAM

The ANALYZE program was the primary tool for analyzing the detailed performance of the vendor classifiers on a vehicle-by-vehicle basis. This program contained an algorithm which matched the vehicles from the tape data (ground truth data) to those from the vendor files. After matching the vehicles, the program collected statistics of classification accuracy, overall length measurements, axle spacing measurements and wheelbase measurements. The output of the program is a set of files containing tables of results and examples of suspected splits or combinations of vehicles by the classifiers. A split occurs when a classifier classifies a single vehicle as two separate, smaller vehicles. a combination occurs when two vehicles are classified a single larger vehicle by the classifier.

The ANALYZE program looks at the data from three vehicles from the ground truth file and three from the vendor classifier file at a time. The input files are assumed to be in the standard format and the clocks are assumed to be synchronized. If the clocks are not synchronized, then differences must be determined manually and adjustments made to the vendor data file. The program will attempt to find the best match between the ground truth vehicle and one of the vendor vehicles. The best match is made based on time and number of axles. A flow chart of the vehicle matching algorithm of the ANALYZE program is shown in Appendix C.

The user can set a maximum time differential to be used when determining that a ground truth vehicle and a vendor data vehicle match. For this project, the maximum time differential was set at 2 seconds. If no unmatched vendor vehicle was within the maximum time differential of an unmatched ground truth vehicle, then that ground truth vehicle was declared to be a Missing vehicle (missing from the vendor file). If no unmatched ground truth vehicle was within the maximum time differential of an unmatched vendor vehicle, then the vendor vehicle was declared to be an Extra vehicle. Missing and Extra vehicles most often occurred when vehicles changed lanes, or when the vendor equipment or the pole camera was not operating for a short period of time.

The ANALYZE program was designed to give the vendor classifier the benefit of the doubt when performing vehicle matching. The program seeks a match where the time difference is minimized and the number of axles is the same. If the number of axles differs between the vendor vehicle and the ground truth vehicle, the program searches for splits and combinations of vehicles. If no splits or combinations are found then the program declares this a Sensor Error. The misclassification is recorded, but no length or axle spacings measurements are used in the statistics for the device. Only a match in time and number of axles is used in calculating the length and axle spacing statistics.

When ANALYZE is run, the user is prompted to enter the "Real" (ground truth) data file name and the "Vendor" (classifier) data file name. These files are expected to be in the standard format. The program then prompts the user to enter the start time for the analysis (must be in the starting day of the ground truth data). Finally, the user is asked to enter the "Time Interval" (maximum time differential).

The outputs of ANALYZE are the following seven files:

TABLE.OUT - The file containing a classification matrix depicting the classification accuracy of the vendor classifier. It also contains the mean and standard deviation of the vehicle length, wheelbase and axle spacing measurements as a function of the speed of the vehicle.

MAIN.OUT - The file contains the vehicle data from the ground truth and the vendor data files for every vehicle which was not matched in time and number of axles.

EXTRAV.OUT - This file contains the data from the ground truth vehicles for which there were no matching vehicle in the vendor data file.

MISSINGV.OUT - This file contains data from the vendor vehicle for which there were no matching vehicle in the ground truth data file.

SENSORER.OUT- This file contains the vehicle data from the vendor and ground truth data files for vehicles which matched in time, but had different number of axles (declared a Sensor Error).

MISTYPED.OUT - This file contains the vehicle data from the vendor and ground truth data files for vehicles which matched in time and number of axles, but had different classifications.

SPLT-CMB.OUT - This file contains the vehicle data from the vendor and ground truth data files for vehicles which the vendor classifier either split into two vehicles, or combined two vehicles into one.

The TABLE.OUT file contains the primary results of the ANALYZE program. The other files, particularly SPLT-CMB.OUT, are used to check the classification errors detected by the program for accuracy. Certain combinations of lane changes, sensor errors, and dense traffic caused the program to determine the splits or combinations occurred when, in fact, there were none. These types of errors were few and far between, and did not significantly impact the results.

4.6 TYPICAL ANALYSIS OUTPUTS

Figure 24 is an example of the output of the BINNED program. The first line is the input file name (standard formatted file). Then the date is shown followed by the binned data for that day. The first two columns are the start and stop time for the bin given as HHMMSS, where HH is the hour (24 hour clock), MM is the minute and SS is the second. The next two columns show the total axle and vehicle count for the bin. The next fifteen columns show the vehicle count in the 13 FHWA vehicle classes, the class 14 (which is unused by all the classifiers), and class 15 (usually used for unknown vehicle types). The remaining three columns list average speed in MPH (if given by the classifier), the number of vehicles with greater than two axles, and the percentage of vehicles with greater then two axles. Daily totals are provided, and 7-day totals are calculated for the long-term test.

Figure 25 shows and example of the ANALYZE programs output to the TABLE.OUT file. This file contains a classification matrix, and statistical summaries of the axle spacing, wheelbase, and overall length measurements. The first line contains the filename for the vendor classifier data, and the second line contains the time interval (maximum delta time allowed) used for the ANALYZE matching algorithm. The first matrix depicts the total vehicles as classified by the vendor classifier and the ground truth data. The vendor classes are numbered at the top of the columns, and the ground truth classification is numbered at the left of the rows. In other words, the number in the column C and row R is the total number of class R vehicles (as determined from the CVCRS) that were classified as class C by the vendor classifier.

The second matrix in the TABLE.OUT file is identical to the first, except the totals are expressed as percentages of the total vehicles in the class (ground truth). Following the matrices are the totals of the real (ground truth) vehicles, the vendor vehicles classified, the number of mistyped vehicles, the number of sensor errors detected (miscounted axles), the number of extra vendor vehicle not in the ground truth data, the number of missing vehicles not in the classifier's data file, and the number of correctly classified vehicles. Also totalled is the number of split and combined vehicles suspected by the ANALYZE program. The file of split and combined vehicles detected by the ANALYZE program was manually reviewed to determine the actual split and combination count for the classifier.

Following the totals are summaries of the length measurement statistics for the classifier. The statistics on the accuracy of axle spacing, wheelbase and overall vehicle length measurements are summarized as a function of speed. The speed bins are 5 MPH wide from 30 to 80 MPH. The mean and standard deviation of the measurement, and the total number of vehicles in the speed bin are listed. For the axle spacing measurements, the total axle spacings (i.e. 4 axle spacings are on a 5-axle truck) for each speed bin are also

Date: 9-12-93

Class----------	-Axl	---Veh		1	2	3	4	5	6	7	8	9	10	11	12	13	15
0	1500	102	46	0	29	13	0	0	1	0	0	3	0	0	0	0	0
1500	3000	76	36	1	17	16	1	0	0	0	0	1	0	0	0	0	0
3000	4500	84	36	0	21	10	0	2	1	0	0	2	0	0	0	0	0
4500	10000	88	36	0	20	11	0	0	0	0	1	4	0	0	0	0	0
10000	11500	90	36	0	22	7	0	2	0	0	1	4	0	0	0	0	0
11500	13000	72	32	1	18	11	0	0	0	0	0	2	0	0	0	0	0
13000	14500	57	22	0	12	4	1	1	0	0	0	3	0	0	1	0	0
14500	20000	59	25	0	15	7	0	0	0	0	0	3	0	0	0	0	0
20000	21500	73	32	0	19	9	0	1	0	0	0	3	0	0	0	0	0
21500	23000	66	24	0	12	6	0	0	0	0	0	6	0	0	0	0	0
23000	24500	42	16	0	6	6	1	0	1	0	0	2	0	0	0	0	0
24500	30000	55	19	0	7	6	0	1	0	0	0	5	0	0	0	0	0
30000	31500	23	11	0	7	3	0	1	0	0	0	0	0	0	0	0	0
31500	33000	43	14	0	4	5	0	0	0	0	0	5	0	0	0	0	0
33000	34500	35	15	0	8	4	0	2	1	0	0	0	0	0	0	0	0
34500	40000	37	14	0	6	3	1	0	1	0	1	2	0	0	0	0	0
40000	41500	68	29	0	17	7	1	1	0	0	0	3	0	0	0	0	0
41500	43000	53	20	1	5	7	4	0	0	0	0	3	0	0	0	0	0
43000	44500	61	24	0	12	7	0	0	1	0	0	4	0	0	0	0	0
44500	50000	53	20	0	6	9	3	0	0	0	0	2	0	0	0	0	0
50000	51500	30	12	0	3	5	3	0	0	0	0	1	0	0	0	0	0
51500	53000	66	26	0	13	8	0	0	1	0	0	4	0	0	0	0	0
53000	54500	52	23	0	17	4	0	0	0	0	0	2	0	0	0	0	0
54500	60000	58	24	0	15	5	0	1	0	0	0	3	0	0	0	0	0
60000	61500	46	20	0	9	9	0	0	0	0	0	2	0	0	0	0	0
61500	63000	68	26	0	10	11	0	1	0	0	0	4	0	0	0	0	0
63000	64500	64	25	0	10	10	0	1	0	0	0	4	0	0	0	0	0
64500	70000	57	24	0	10	11	0	0	0	0	0	3	0	0	0	0	0

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184500	190000	381	179	0	100	71	0	3	1	0	0	4	0	0	0	0	0
190000	191500	386	175	1	98	63	0	4	0	0	0	9	0	0	0	0	0
191500	193000	396	180	0	116	54	0	2	0	0	0	7	0	1	0	0	0
193000	194500	365	164	0	104	51	0	0	0	0	1	8	0	0	0	0	0
194500	200000	366	160	0	99	48	0	3	1	0	0	9	0	0	0	0	0
200000	201500	335	150	0	79	60	0	2	1	0	0	7	0	1	0	0	0
201500	203000	327	148	0	100	38	1	0	0	0	0	9	0	0	0	0	0
203000	204500	344	157	1	102	43	0	4	0	0	0	7	0	0	0	0	0
204500	210000	299	130	0	72	46	0	1	0	0	0	9	0	1	1	0	0
210000	211500	281	128	0	82	37	0	2	0	0	0	5	0	2	0	0	0
211500	213000	268	116	0	77	29	0	0	1	0	1	5	0	3	0	0	0
213000	214500	281	116	0	63	36	0	2	0	0	0	15	0	0	0	0	0
214500	220000	243	101	0	64	24	0	3	0	0	0	10	0	0	0	0	0
220000	221500	233	102	0	66	26	0	1	1	0	0	6	0	2	0	0	0
221500	223000	200	81	0	46	22	0	0	0	0	3	10	0	0	0	0	0
223000	224500	211	85	0	52	19	0	0	1	0	0	13	0	0	0	0	0
224500	230000	198	78	1	34	29	0	0	0	0	0	14	0	0	0	0	0
230000	231500	169	68	0	40	17	0	2	0	0	0	9	0	0	0	0	0
231500	233000	166	66	0	34	22	0	1	0	0	0	9	0	0	0	0	0
233000	234500	115	47	1	28	10	0	1	0	0	0	7	0	0	0	0	0
234500	0	98	38	0	21	9	0	1	0	0	0	7	0	0	0	0	0
TOTALS:		21651	9657	23	5522	3319	34	169	36	1	21	516	2	12	2	0	0

Figure 24. Example Output of the BINNED Program

Time interval: 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	15	1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	3	8565	135	0	4	1	0	12	5	3	1	0	1	0	0
3	1	3503	1881	0	40	1	0	66	6	1	0	0	2	0	0
4	0	0	3	5	21	13	2	0	0	0	0	0	1	0	0
5	0	11	135	4	182	0	1	32	0	0	0	0	2	0	0
6	0	1	7	2	0	164	3	5	7	0	0	0	3	0	0
7	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0
8	2	19	5	0	0	0	2	228	3	0	1	0	1	0	0
9	2	20	12	0	5	2	0	22	2229	507	49	2	34	0	0
10	0	2	1	0	0	0	0	2	2	17	1	0	1	0	0
11	0	1	0	0	0	0	0	0	1	0	80	2	1	0	0
12	0	0	0	0	0	0	0	0	0	0	0	27	1	0	0
13	0	0	0	0	0	0	0	1	0	4	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	93.8	6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	98.1	1.5	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	63.7	34.2	0.0	0.7	0.0	0.0	1.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	6.7	11.1	46.7	28.9	4.4	0.0	0.0	0.0	0.0	0.0	2.2	0.0	0.0
5	0.0	3.0	36.8	1.1	49.6	0.0	0.3	8.7	0.0	0.0	0.0	0.0	0.5	0.0	0.0
6	0.0	0.5	3.6	1.0	0.0	85.4	1.6	2.6	3.6	0.0	0.0	0.0	1.6	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	50.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.8	7.3	1.9	0.0	0.0	0.0	0.8	87.4	1.1	0.0	0.4	0.0	0.4	0.0	0.0
9	0.1	0.7	0.4	0.0	0.2	0.1	0.0	0.8	77.3	17.6	1.7	0.1	1.2	0.0	0.0
10	0.0	7.7	3.8	0.0	0.0	0.0	0.0	7.7	7.7	65.4	3.8	0.0	3.8	0.0	0.0
11	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	94.1	2.4	1.2	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	96.4	3.6	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	0.0	80.0	0.0	0.0	0.0	0.0	0.0
14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

#Real:	19091
#Vendor:	19186
#mistyped:	4751
#sensor err:	793
#extra Vend:	927
#Missing Vend:	864
#Correct:	13393
#Splits:	49
#Combinations:	17

Figure 25. Example Output of the ANALYZE Program

listed. The overall (independent of speed) mean, standard deviation and vehicle totals are listed for each measurement. If applicable or existing information is available, the following statistics are calculated and listed in the file TABLE.OUT:

- Axle Spacing - True (ground truth) length less the measured length (classifier) in feet,
- Wheelbase - True length minus measured length in feet,
- Overall Length - True length minus measured length in feet,
- Overall Length Percentage - True length times 100 and divided by the measured length.