US006850946B1

(12) **United States Patent**
Rappaport et al.

(10) **Patent No.: US 6,850,946 B1**
(45) **Date of Patent: Feb. 1, 2005**

(54) **METHOD AND SYSTEM FOR A BUILDING DATABASE MANIPULATOR**

(75) Inventors: **Theodore S. Rappaport**, Blacksburg, VA (US); **Roger R. Skidmore**, Blacksburg, VA (US)

(73) Assignee: **Wireless Valley Communications, Inc.**, Austin, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/318,841**

(22) Filed: **May 26, 1999**

(51) **Int. Cl.**[7] **G06F 17/30**
(52) **U.S. Cl.** **707/101**; 707/10
(58) **Field of Search** 707/1, 10, 101; 709/217, 218; 348/460, 563, 906; 703/1, 2; 745/39, 63; 345/964

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,675,147 A		6/1987	Schaefer et al.	376/245
4,736,453 A		4/1988	Schloemer	455/450
4,885,694 A	*	12/1989	Pray et al.	705/400
5,111,392 A		5/1992	Malin	705/29
5,119,307 A		6/1992	Blaha et al.	700/107
5,239,487 A		8/1993	Horejsi et al.	702/184
5,293,640 A		3/1994	Gunmar et al.	455/446
5,307,261 A		4/1994	Maki et al.	705/29
5,337,149 A		8/1994	Kozah et al.	356/601
5,339,184 A		8/1994	Tang	398/116
5,375,123 A		12/1994	Andersson et al.	370/333
5,394,522 A		2/1995	Sanchez-Frank et al.	345/735
5,450,615 A		9/1995	Fortune et al.	455/67.16
5,458,123 A		10/1995	Unger	600/509
5,465,390 A		11/1995	Cohen	455/446
5,467,441 A		11/1995	Stone et al.	345/619
5,482,050 A		1/1996	Smokoff et al.	600/523
5,485,568 A	*	1/1996	Venable et al.	707/500
5,491,644 A		2/1996	Pickering et al.	709/226
5,491,837 A		2/1996	Haartsen	455/62
5,493,679 A	*	2/1996	Virgil et al.	707/104.1
5,515,269 A		5/1996	Willis et al.	705/29
5,528,518 A		6/1996	Bradshaw et al.	702/150
5,539,665 A		7/1996	Lamming et al.	709/224
5,553,312 A		9/1996	Gattey et al.	455/11.1
5,553,620 A		9/1996	Snider et al.	600/440
5,555,354 A		9/1996	Strasnick et al.	345/427
5,561,841 A		10/1996	Markus	455/446

(List continued on next page.)

OTHER PUBLICATIONS

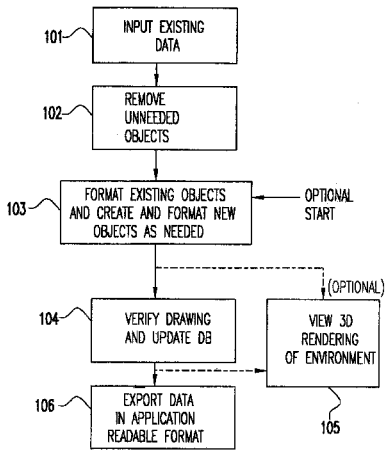
From Bird's Eye Real–time Mapping Software dated Jun. 30, 2002.

IEEE Transactions on Antennas and propagation, vol. 46, No. 8, Aug. 1998. "Effect of Terrain on Path Loss in Urban Enviroments for Wireless Applications" Leonard Piazzi and Henry L. Bertoni.

(List continued on next page.)

Primary Examiner—Vincent Millin
Assistant Examiner—Ella Colbert
(74) *Attorney, Agent, or Firm*—Whitham, Curtis & Christofferson, P.C.

(57) **ABSTRACT**

A Building Database Manipulator to build databases for a variety of physical environments including definitions of buildings, terrain and other site parameters, by scanning in or rapidly editing data. Raster scans may be entered or object files in various formats may be used as input. Detailed information is stored in the drawing database about the object's location, radio frequency attenuation, color, and other physical information such as electrical characteristics and intersections of the object with the ground, floors, ceilings, and other objects when objects are formatted in a drawing. The formatting process is strictly two-dimensional in nature, but the resulting drawing is a true three-dimensional environment. The user sees the three-dimensional building structure by altering the views. The resulting database may be used in a variety of modeling applications, but is especially useful for engineering, planning and management tools for in-building or microcell wireless systems.

17 Claims, 8 Drawing Sheets