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(54) **METHOD AND SYSTEM FOR WAKING UP A DEVICE DUE TO MOTION**

5,313,060	A	5/1994	Gast et al.
5,386,210	A	1/1995	Lee
5,430,480	A	7/1995	Allen et al.
5,446,725	A	8/1995	Ishiwatari
5,446,775	A	8/1995	Wright et al.
5,454,114	A	9/1995	Yach et al.
5,485,402	A	1/1996	Smith et al.
5,506,987	A	4/1996	Abramson et al.
5,515,419	A	5/1996	Sheffer
5,583,776	A	12/1996	Levi et al.
5,593,431	A	1/1997	Sheldon
5,654,619	A	8/1997	Iwashita

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(Continued)

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FOREIGN PATENT DOCUMENTS

EP	1 104 143	5/2001
EP	0 833 537	7/2002

(Continued)

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OTHER PUBLICATIONS

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(Continued)

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(57) **ABSTRACT**

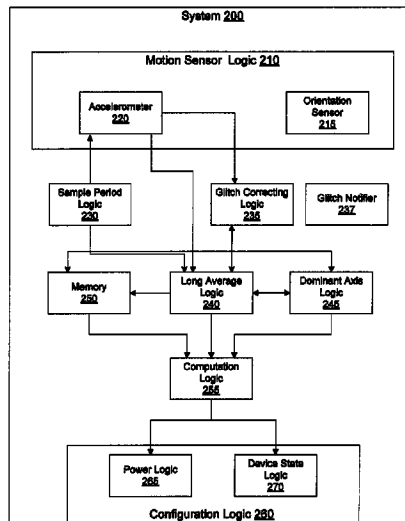
A method comprises determining an idle sample value for a dominant axis of a device in an idle state. The method further comprises registering a motion of the device, and evaluating the motion. The method further comprises waking up the device when the analysis of the motion indicates a change in the dominant axis of the device and/or a level of acceleration beyond a threshold.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,285,041	A	8/1981	Smith
4,571,680	A	2/1986	Wu
4,578,769	A	3/1986	Frederick
4,700,369	A	10/1987	Seigal et al.
4,776,323	A	10/1988	Spector

**22 Claims, 7 Drawing Sheets**



(56)

References Cited

U.S. PATENT DOCUMENTS

5,737,439	A	4/1998	Lapsley et al.	7,173,604	B2	2/2007	Marvit et al.
5,771,001	A	6/1998	Cobb	7,176,886	B2	2/2007	Marvit et al.
5,778,882	A	7/1998	Raymond et al.	7,176,887	B2	2/2007	Marvit et al.
5,911,065	A	6/1999	Williams et al.	7,176,888	B2	2/2007	Marvit et al.
5,955,667	A	9/1999	Fyfe	7,177,684	B1	2/2007	Kroll et al.
5,960,085	A	9/1999	de la Huerga	7,180,500	B2	2/2007	Marvit et al.
5,976,083	A	11/1999	Richardson et al.	7,180,501	B2	2/2007	Marvit et al.
6,013,007	A	1/2000	Root et al.	7,180,502	B2	2/2007	Marvit et al.
6,061,456	A	5/2000	Andrea et al.	7,212,230	B2	5/2007	Stavely
6,122,595	A	9/2000	Varley et al.	7,212,943	B2	5/2007	Aoshima et
6,129,686	A	10/2000	Friedman	7,220,220	B2	5/2007	Stubbs et al.
6,135,951	A	10/2000	Richardson et al.	7,245,725	B1	7/2007	Beard
6,145,389	A	11/2000	Ebeling et al.	7,254,516	B2	8/2007	Case et al.
6,246,321	B1	6/2001	Rechsteiner et al.	7,280,096	B2	10/2007	Marvit et al.
6,282,496	B1	8/2001	Chowdhary	7,297,088	B2	11/2007	Tsuji
6,353,449	B1*	3/2002	Gregg et al. .... 715/762	7,301,526	B2	11/2007	Marvit et al.
6,369,794	B1	4/2002	Sakurai et al.	7,301,527	B2	11/2007	Marvit et al.
6,396,883	B2	5/2002	Yang et al.	7,301,528	B2	11/2007	Marvit et al.
6,408,330	B1	6/2002	DeLaHuerga	7,301,529	B2	11/2007	Marvit et al.
6,428,490	B1	8/2002	Kramer et al.	7,305,323	B2	12/2007	Skvortsov et al.
6,470,147	B1	10/2002	Imada	7,334,472	B2	2/2008	Seo et al.
6,478,736	B1	11/2002	Mault	7,343,260	B1	3/2008	Kahn
6,493,652	B1	12/2002	Ohlenbusch et al.	7,353,112	B2	4/2008	Choi et al.
6,496,695	B1	12/2002	Kouji et al.	7,365,735	B2	4/2008	Reinhardt et al.
6,513,381	B2	2/2003	Fyfe et al.	7,365,736	B2	4/2008	Marvit et al.
6,522,266	B1	2/2003	Soehren et al.	7,365,737	B2	4/2008	Marvit et al.
6,529,144	B1	3/2003	Nilsen et al.	7,379,999	B1	5/2008	Zhou et al.
6,532,419	B1	3/2003	Begin et al.	7,382,611	B2	6/2008	Tracy et al.
6,539,336	B1	3/2003	Vock et al.	7,387,611	B2	6/2008	Inoue et al.
6,595,929	B2	7/2003	Stivoric et al.	7,397,357	B2	7/2008	Krumm et al.
6,607,493	B2	8/2003	Song	7,428,471	B2	9/2008	Darley et al.
6,611,789	B1	8/2003	Darley	7,451,056	B2	11/2008	Flentov et al.
6,628,898	B2	9/2003	Endo	7,457,719	B1	11/2008	Kahn et al.
6,634,992	B1	10/2003	Ogawa	7,457,872	B2	11/2008	Aton et al.
6,665,802	B1	12/2003	Ober	7,463,997	B2	12/2008	Pasolini et al.
6,672,991	B2	1/2004	O'Malley	7,467,060	B2	12/2008	Kulach et al.
6,685,480	B2	2/2004	Nishimoto et al.	7,489,937	B2	2/2009	Chung et al.
6,700,499	B2	3/2004	Kubo et al.	7,502,643	B2	3/2009	Farrington et al.
6,731,958	B1	5/2004	Shirai	7,512,515	B2	3/2009	Vock et al.
6,766,176	B1	7/2004	Gupta et al.	7,526,402	B2	4/2009	Tanenhaus et al.
6,771,250	B1*	8/2004	Oh ..... 345/156	7,608,050	B2	10/2009	Sugg
6,786,877	B2	9/2004	Foxlin	7,617,071	B2	11/2009	Darley et al.
6,788,980	B1	9/2004	Johnson	7,640,134	B2	12/2009	Park et al.
6,790,178	B1	9/2004	Mault et al.	7,640,804	B2	1/2010	Daumer et al.
6,813,582	B2	11/2004	Levi et al.	7,647,195	B1	1/2010	Kahn
6,823,036	B1	11/2004	Chen	7,647,196	B2	1/2010	Kahn et al.
6,826,477	B2	11/2004	Ladetto et al.	7,653,508	B1	1/2010	Kahn
6,836,744	B1	12/2004	Asphahani et al.	7,664,657	B1	2/2010	Letzt et al.
6,881,191	B2	4/2005	Oakley et al.	7,689,107	B2	3/2010	Enomoto
6,885,971	B2	4/2005	Vock et al.	7,705,884	B2	4/2010	Pinto et al.
6,895,425	B1	5/2005	Kadyk et al.	7,752,011	B2	7/2010	Niva et al.
6,898,550	B1	5/2005	Blackadar et al.	7,753,861	B1	7/2010	Kahn et al.
6,928,382	B2	8/2005	Hong et al.	7,765,553	B2	7/2010	Douceur et al.
6,941,239	B2	9/2005	Unuma et al.	7,774,156	B2	8/2010	Niva et al.
6,959,259	B2	10/2005	Vock et al.	7,788,059	B1	8/2010	Kahn et al.
6,975,959	B2	12/2005	Dietrich et al.	7,857,772	B2	12/2010	Bouvier et al.
7,002,553	B2	2/2006	Shkolnikov	7,881,902	B1	2/2011	Kahn
7,010,332	B1	3/2006	Irvin et al.	7,889,085	B2	2/2011	Downey et al.
7,020,487	B2	3/2006	Kimata	7,892,080	B1	2/2011	Dahl
7,027,087	B2	4/2006	Nozaki et al.	7,917,768	B2	3/2011	Kahn
7,028,547	B2	4/2006	Shiratori et al.	7,962,312	B2	6/2011	Darley et al.
7,042,509	B2	5/2006	Onuki	7,987,070	B2	7/2011	Kahn
7,054,784	B2	5/2006	Flentov et al.	8,140,115	B1	3/2012	Kahn
7,057,551	B1	6/2006	Vogt	8,187,182	B2	5/2012	Kahn
7,072,789	B2	7/2006	Vock et al.	8,275,635	B2	9/2012	Stivoric et al.
7,092,846	B2	8/2006	Vock et al.	8,285,344	B2	10/2012	Kahn
7,096,619	B2	8/2006	Jackson et al.	8,320,578	B2	11/2012	Kahn
7,148,797	B2	12/2006	Albert	8,398,546	B2	3/2013	Pacione et al.
7,148,879	B2	12/2006	Amento et al.	8,555,282	B1	10/2013	Kahn
7,149,964	B1	12/2006	Cottrille et al.	8,568,310	B2	10/2013	Kahn
7,155,507	B2	12/2006	Hirano et al.	8,725,527	B1	5/2014	Kahn
7,158,912	B2	1/2007	Vock et al.	2001/0047488	A1	11/2001	Verplaetse et al.
7,169,084	B2	1/2007	Tsuji	2002/0006284	A1	1/2002	Kim
				2002/0023654	A1	2/2002	Webb
				2002/0027164	A1	3/2002	Mault et al.
				2002/0042830	A1	4/2002	Bose et al.
				2002/0044634	A1	4/2002	Rooke et al.

(56)

References Cited

U.S. PATENT DOCUMENTS

2002/0109600	A1	8/2002	Mault et al.	2005/0131736	A1	6/2005	Nelson et al.
2002/0118121	A1	8/2002	Lehrman et al.	2005/0141522	A1	6/2005	Kadar et al.
2002/0122543	A1	9/2002	Rowen	2005/0143106	A1	6/2005	Chan et al.
2002/0138017	A1	9/2002	Bui et al.	2005/0146431	A1	7/2005	Hastings et al.
2002/0142887	A1	10/2002	O'Malley	2005/0157181	A1	7/2005	Kawahara et al.
2002/0150302	A1	10/2002	McCarthy et al.	2005/0165719	A1	7/2005	Greenspan et al.
2002/0151810	A1	10/2002	Wong et al.	2005/0168587	A1	8/2005	Sato et al.
2002/0173295	A1	11/2002	Nykanen et al.	2005/0182824	A1	8/2005	Cotte
2002/0190947	A1	12/2002	Feinstein	2005/0183086	A1	8/2005	Abe et al.
2002/0193124	A1	12/2002	Hamilton et al.	2005/0202934	A1	9/2005	Olrik et al.
2003/0018430	A1	1/2003	Ladetto et al.	2005/0203430	A1	9/2005	Williams et al.
2003/0033411	A1	2/2003	Kavoori et al.	2005/0210300	A1	9/2005	Song et al.
2003/0048218	A1	3/2003	Milnes et al.	2005/0212751	A1	9/2005	Marvit et al.
2003/0083596	A1	5/2003	Kramer et al.	2005/0212752	A1	9/2005	Marvit et al.
2003/0093187	A1	5/2003	Walker	2005/0212753	A1	9/2005	Marvit et al.
2003/0101260	A1	5/2003	Dacier et al.	2005/0212760	A1	9/2005	Marvit et al.
2003/0109258	A1	6/2003	Mantjarvi et al.	2005/0216403	A1	9/2005	Tam et al.
2003/0139692	A1	7/2003	Barrey et al.	2005/0222801	A1	10/2005	Wulff et al.
2003/0139908	A1	7/2003	Wegerich et al.	2005/0232388	A1	10/2005	Tsuji
2003/0149526	A1	8/2003	Zhou et al.	2005/0232404	A1	10/2005	Gaskill
2003/0151672	A1	8/2003	Robins et al.	2005/0234676	A1	10/2005	Shibayama
2003/0187683	A1	10/2003	Kirchhoff et al.	2005/0235058	A1	10/2005	Rackus et al.
2003/0208110	A1	11/2003	Mault et al.	2005/0238132	A1	10/2005	Tsuji
2003/0208113	A1	11/2003	Mault et al.	2005/0240375	A1	10/2005	Sugai
2003/0227487	A1	12/2003	Hugh	2005/0243178	A1	11/2005	McConica
2003/0236625	A1	12/2003	Brown et al.	2005/0245988	A1	11/2005	Miesel
2004/0017300	A1	1/2004	Kotzin et al.	2005/0248718	A1	11/2005	Howell et al.
2004/0024846	A1	2/2004	Randall et al.	2005/0256414	A1	11/2005	Kettunen et al.
2004/0043760	A1	3/2004	Rosenfeld et al.	2005/0258938	A1	11/2005	Moulson
2004/0044493	A1	3/2004	Coulthard	2005/0262237	A1	11/2005	Fulton et al.
2004/0047498	A1	3/2004	Mulet-Parada et al.	2005/0281289	A1	12/2005	Huang et al.
2004/0078219	A1	4/2004	Kaylor et al.	2006/0009243	A1	1/2006	Dahan et al.
2004/0078220	A1	4/2004	Jackson	2006/0017692	A1	1/2006	Wehrenberg et al.
2004/0081441	A1	4/2004	Sato et al.	2006/0020177	A1	1/2006	Seo et al.
2004/0106421	A1	6/2004	Tomiyoshi et al.	2006/0029284	A1	2/2006	Stewart
2004/0106958	A1	6/2004	Mathis et al.	2006/0063980	A1	3/2006	Hwang et al.
2004/0122294	A1	6/2004	Hatlestad et al.	2006/0064276	A1	3/2006	Ren et al.
2004/0122295	A1	6/2004	Hatlestad et al.	2006/0080551	A1	4/2006	Mantjarvi et al.
2004/0122296	A1	6/2004	Hatlestad et al.	2006/0090088	A1	4/2006	Choi et al.
2004/0122297	A1	6/2004	Hatlestad et al.	2006/0090161	A1	4/2006	Bodas et al.
2004/0122333	A1	6/2004	Nissila	2006/0098097	A1	5/2006	Wach et al.
2004/0122484	A1	6/2004	Hatlestad et al.	2006/0100546	A1	5/2006	Silk
2004/0122485	A1	6/2004	Hatlestad et al.	2006/0109113	A1	5/2006	Reyes et al.
2004/0122486	A1	6/2004	Hatlestad et al.	2006/0136173	A1	6/2006	Case, Jr. et al.
2004/0122487	A1	6/2004	Hatlestad et al.	2006/0149516	A1	7/2006	Bond et al.
2004/0125073	A1	7/2004	Potter et al.	2006/0154642	A1	7/2006	Scannell, Jr.
2004/0130628	A1	7/2004	Stavely	2006/0161377	A1*	7/2006	Rakkola et al. .... 702/141
2004/0135898	A1	7/2004	Zador	2006/0161459	A9	7/2006	Rosenfeld et al.
2004/0146048	A1	7/2004	Cotte	2006/0167387	A1	7/2006	Buchholz et al.
2004/0148340	A1	7/2004	Cotte	2006/0167647	A1	7/2006	Krumm et al.
2004/0148341	A1	7/2004	Cotte	2006/0167943	A1	7/2006	Rosenberg
2004/0148342	A1	7/2004	Cotte	2006/0172706	A1	8/2006	Griffin et al.
2004/0148351	A1	7/2004	Cotte	2006/0174685	A1	8/2006	Skvortsov et al.
2004/0172167	A1	9/2004	Pasolini et al.	2006/0201964	A1	9/2006	DiPerna et al.
2004/0176067	A1	9/2004	Lakhani et al.	2006/0204214	A1	9/2006	Shah et al.
2004/0185821	A1	9/2004	Yuasa	2006/0205406	A1	9/2006	Pekonen et al.
2004/0219910	A1	11/2004	Beckers	2006/0206258	A1	9/2006	Brooks
2004/0225467	A1	11/2004	Vock et al.	2006/0223547	A1	10/2006	Chin et al.
2004/0236500	A1	11/2004	Choi et al.	2006/0249683	A1	11/2006	Goldberg et al.
2004/0242202	A1	12/2004	Torvinen	2006/0256082	A1	11/2006	Cho et al.
2004/0247030	A1	12/2004	Wiethoff	2006/0257042	A1	11/2006	Ofek et al.
2004/0259494	A1	12/2004	Mazar	2006/0259268	A1	11/2006	Vock et al.
2005/0015768	A1	1/2005	Moore	2006/0288781	A1	12/2006	Daumer et al.
2005/0027567	A1	2/2005	Taha	2006/0289819	A1	12/2006	Parsons et al.
2005/0033200	A1	2/2005	Soehren et al.	2007/0004451	A1	1/2007	Anderson
2005/0038691	A1	2/2005	Babu	2007/0005988	A1	1/2007	Zhengyou et al.
2005/0048945	A1	3/2005	Porter	2007/0017136	A1	1/2007	Mosher et al.
2005/0048955	A1	3/2005	Ring	2007/0024441	A1	2/2007	Kahn et al.
2005/0078197	A1	4/2005	Gonzales	2007/0037605	A1	2/2007	Logan et al.
2005/0079873	A1	4/2005	Caspi et al.	2007/0037610	A1	2/2007	Logan
2005/0101841	A9	5/2005	Kaylor et al.	2007/0038364	A1	2/2007	Lee et al.
2005/0102167	A1	5/2005	Kapoor	2007/0040892	A1	2/2007	Aoki et al.
2005/0107944	A1	5/2005	Hovestadt et al.	2007/0050157	A1	3/2007	Kahn et al.
				2007/0061105	A1	3/2007	Darley et al.
				2007/0063850	A1	3/2007	Devaul et al.
				2007/0067094	A1	3/2007	Park et al.
				2007/0073482	A1	3/2007	Churchill et al.

(56)

References Cited

U.S. PATENT DOCUMENTS

2007/0078324 A1 4/2007 Wijisiriwardana  
 2007/0082789 A1 4/2007 Nissila et al.  
 2007/0102525 A1 5/2007 Orr et al.  
 2007/0104479 A1 5/2007 Machida  
 2007/0106991 A1 5/2007 Yoo  
 2007/0125852 A1 6/2007 Rosenberg  
 2007/0130582 A1 6/2007 Chang et al.  
 2007/0142715 A1 6/2007 Banet et al.  
 2007/0143068 A1 6/2007 Pasolini et al.  
 2007/0145680 A1 6/2007 Rosenberg  
 2007/0150136 A1\* 6/2007 Doll et al. .... 701/34  
 2007/0156364 A1 7/2007 Rothkopf  
 2007/0161410 A1 7/2007 Huang et al.  
 2007/0165790 A1 7/2007 Taori  
 2007/0169126 A1 7/2007 Todoroki et al.  
 2007/0176898 A1 8/2007 Suh  
 2007/0192483 A1 8/2007 Rezvani et al.  
 2007/0195784 A1 8/2007 Allen et al.  
 2007/0208531 A1 9/2007 Darley et al.  
 2007/0208544 A1 9/2007 Kulach et al.  
 2007/0213085 A1 9/2007 Fedora  
 2007/0213126 A1 9/2007 Deutsch et al.  
 2007/0233788 A1 10/2007 Bender  
 2007/0239399 A1 10/2007 Sheynblat et al.  
 2007/0250261 A1 10/2007 Soehren  
 2007/0259685 A1 11/2007 Engblom et al.  
 2007/0259716 A1\* 11/2007 Mattice et al. .... 463/36  
 2007/0259717 A1 11/2007 Mattice et al.  
 2007/0260418 A1 11/2007 Ladetto et al.  
 2007/0260482 A1 11/2007 Nurmela et al.  
 2007/0263995 A1 11/2007 Park et al.  
 2007/0296696 A1 12/2007 Nurmi  
 2008/0005738 A1 1/2008 Imai et al.  
 2008/0030586 A1 2/2008 Helbing et al.  
 2008/0046888 A1 2/2008 Appaji  
 2008/0052716 A1 2/2008 Theurer  
 2008/0072014 A1 3/2008 Krishnan et al.  
 2008/0102785 A1 5/2008 Childress et al.  
 2008/0113689 A1 5/2008 Bailey  
 2008/0140338 A1 6/2008 No et al.  
 2008/0153671 A1 6/2008 Ogg et al.  
 2008/0161072 A1 7/2008 Lide et al.  
 2008/0165022 A1 7/2008 Herz et al.  
 2008/0168361 A1 7/2008 Forstall et al.  
 2008/0171918 A1 7/2008 Teller et al.  
 2008/0214358 A1 9/2008 Ogg et al.  
 2008/0231713 A1 9/2008 Florea et al.  
 2008/0231714 A1 9/2008 Estevez et al.  
 2008/0232604 A1 9/2008 Dufresne et al.  
 2008/0243432 A1 10/2008 Kato et al.  
 2008/0303681 A1 12/2008 Herz et al.  
 2008/0311929 A1 12/2008 Carro et al.  
 2009/0017880 A1 1/2009 Moore et al.  
 2009/0031319 A1 1/2009 Fecioru  
 2009/0043531 A1 2/2009 Kahn et al.  
 2009/0047645 A1 2/2009 Dibenedetto et al.  
 2009/0067826 A1 3/2009 Shinohara et al.  
 2009/0082994 A1 3/2009 Schuler et al.  
 2009/0088204 A1 4/2009 Culbert et al.  
 2009/0098880 A1 4/2009 Lindquist  
 2009/0099668 A1 4/2009 Lehman et al.  
 2009/0124348 A1 5/2009 Yoseloff et al.  
 2009/0128448 A1 5/2009 Riechel  
 2009/0174782 A1 7/2009 Kahn et al.  
 2009/0213002 A1 8/2009 Rani et al.  
 2009/0215502 A1 8/2009 Griffin, Jr.  
 2009/0234614 A1 9/2009 Kahn et al.  
 2009/0274317 A1 11/2009 Kahn et al.  
 2009/0296951 A1 12/2009 De Haan  
 2009/0319221 A1 12/2009 Kahn et al.  
 2009/0325705 A1 12/2009 Filer et al.  
 2010/0056872 A1 3/2010 Kahn et al.

2010/0245131 A1 9/2010 Graumann  
 2010/0277489 A1 11/2010 Geisner et al.  
 2010/0283742 A1 11/2010 Lam

FOREIGN PATENT DOCUMENTS

EP 1271099 A2 1/2003  
 GB 2431813 A 5/2007  
 JP 7020547 A 1/1995  
 JP 2000-90069 3/2000  
 JP 2001-057695 2/2001  
 JP 2001-79699 3/2001  
 JP 2003-014459 1/2003  
 JP 2003-143683 5/2003  
 JP 2005-309691 A 11/2005  
 JP 2006-026092 2/2006  
 JP 2006-118909 5/2006  
 JP 2006-239398 9/2006  
 JP 2007-080219 3/2007  
 JP 2007-093433 4/2007  
 JP 2007-104670 4/2007  
 JP 2007-142611 6/2007  
 JP 2007-206748 8/2007  
 JP 2007-215784 8/2007  
 JP 2007-226855 9/2007  
 JP 2008-173248 7/2008  
 WO WO 99/22338 5/1999  
 WO WO 00/63874 10/2000  
 WO WO 01/88477 A2 11/2001  
 WO WO 02/088926 11/2002  
 WO WO 2006/008790 7/2004

OTHER PUBLICATIONS

Lee, Hyunseok, et al, A Dual Processor Solution for the MAC Layer of a Software Defined Radio Terminal, Advanced Computer Architecture Laboratory, University of Michigan, 25 pages.  
 Weinberg, Harvey, "Minimizing Power Consumption of iMEMS® Accelerometers," Analog Devices, <[http://www.analog.com/static/imported-files/application\\_notes/5935151853362884599AN601.pdf](http://www.analog.com/static/imported-files/application_notes/5935151853362884599AN601.pdf)>, 2002, 5 pages.  
 Zypad WL 1100 Wearable Computer, <[http://www.eurotech.fi/products/manuals/Zypad%20WL%201100\\_sf.pdf](http://www.eurotech.fi/products/manuals/Zypad%20WL%201100_sf.pdf)>, Jan. 16, 2008, 2 pgs.  
 The International Search Report and the Written Opinion, PCT/US2009/059900, mailing date Mar. 31, 2010, 9 pages.  
 Anderson, Ian, et al, "Shakra: Tracking and Sharing Daily Activity Levels with Unaugmented Mobile Phones," Mobile Netw Appl, Aug. 3, 2007, pp. 185-199.  
 Aylward, Ryan, et al, "Senseble: A Wireless, Compact, Multi-User Sensor System for Interactive Dance," International Conference on New Interfaces for Musical Expression (NIME06), Jun. 4-8, 2006, pp. 134-139.  
 Baca, Arnold, et al, "Rapid Feedback Systems for Elite Sports Training," IEEE Pervasive Computing, Oct.-Dec. 2006, pp. 70-76.  
 Bakhru, Kesh, "A Seamless Tracking Solution for Indoor and Outdoor Position Location," IEEE 16th International Symposium on Personal, Indoor, and Mobile Radio Communications, 2005, pp. 2029-2033.  
 Bliley, Kara E, et al, "A Miniaturized Low Power Personal Motion Analysis Logger Utilizing Mems Accelerometers and Low Power Microcontroller," IEEE EMBS Special Topic Conference on Microtechnologies in Medicine and Biology, May 12-15, 2005, pp. 92-93.  
 Bourzac, Katherine, "Wearable Health Reports," Technology Review, Feb. 28, 2006, <[http://www.techreview.com/printer\\_friendly\\_article.aspx?id+16431](http://www.techreview.com/printer_friendly_article.aspx?id+16431)>, accessed Mar. 22, 2007, 3 pages.  
 Cheng, Fangxiang, et al, "Periodic Human Motion Description for Sports Video Databases," Proceedings of the Pattern Recognition, 2004, 5 pages.  
 Dao, Ricardo, "Inclination Sensing with Thermal Accelerometers", MEMSIC, May 2002, 3 pages.  
 Fang, Lei, et al, "Design of a Wireless Assisted Pedestrian Dead Reckoning System—The NavMote Experience," IEEE Transactions

(56)

**References Cited**

## OTHER PUBLICATIONS

Healey, Jennifer, et al, "Wearable Wellness Monitoring Using ECG and Accelerometer Data," IEEE Int. Symposium on Wearable Computers (ISWC'05), 2005, 2 pages.

Hemmes, Jeffrey, et al, "Lessons Learned Building TeamTrak: An Urban/Outdoor Mobile Testbed," 2007 IEEE Int. Conf. on Wireless Algorithms, Aug. 1-3, 2007, pp. 219-224.

Jones, L, et al, "Wireless Physiological Sensor System for Ambulatory Use," <[http://ieeexplore.ieee.org/xpl/freeabs\\_all.jsp?tp=&arnumber=1612917&isnumber=33861](http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?tp=&arnumber=1612917&isnumber=33861)>, Apr. 3-5, 2006.

Jovanov, Emil, et al, "A Wireless Body Area Network of Intelligent Motion Sensors for Computer Assisted Physical Rehabilitation," Journal of NeuroEngineering and Rehabilitation, Mar. 2005, 10 pages.

Kalpaxis, Alex, "Wireless Temporal-Spatial Human Mobility Analysis Using Real-Time Three Dimensional Acceleration Data," IEEE Intl. Multi-Conf. on Computing in Global IT (ICCGI'07), 2007, 7 pages.

Lee, Seon-Woo, et al., "Recognition of Walking Behaviors for Pedestrian Navigation," IEEE International Conference on Control Applications, Sep. 5-7, 2001, pp. 1152-1155.

Margaria, Rodolfo, "Biomechanics and Energetics of Muscular Exercise", Chapter 3, Oxford: Clarendon Press, 1976, pp. 105-125.

Milenkovic, Milena, et al, "An Accelerometer-Based Physical Rehabilitation System," IEEE SouthEastern Symposium on System Theory, 2002, pp. 57-60.

Mizell, David, "Using Gravity to Estimate Accelerometer Orientation", Seventh IEEE International Symposium on Wearable Computers, 2003, 2 pages.

Ornoneit, D, et al, "Learning and Tracking Cyclic Human Motion," 7 pages.

Otto, Chris, et al, "System Architecture of a Wireless Body Area Sensor Network for Ubiquitous Health Monitoring," Journal of Mobile Multimedia, vol. 1, No. 4, 2006, pp. 307-326.

Park, Chulsung, et al, "Eco: An Ultra-Compact Low-Power Wireless Sensor Node for Real-Time Motion Monitoring," IEEE Int. Symp. on Information Processing in Sensor Networks, 2005, pp. 398-403.

Shen, Chien-Lung, et al, "Wearable Band Using a Fabric-Based Sensor for Exercise ECG Monitoring," IEEE Int. Symp. on Wearable Computers, 2006, 2 pages.

"Sensor Fusion," <[www.u-dynamics.com](http://www.u-dynamics.com)>, accessed Aug. 29, 2008, 2 pages.

Tapia, Emmanuel Munguia, et al, "Real-Time Recognition of Physical Activities and Their Intensities Using Wireless Accelerometers and a Heart Rate Monitor," IEEE Conf. on Wearable Computers, Oct. 2007, 4 pages.

Wang, Shu, et al, "Location Based Services for Mobiles: Technologies and Standards, LG Electronics MobileComm," IEEE ICC 2008, Beijing, pp. 1-66 (part 1 of 3).

Wang, Shu, et al, "Location Based Services for Mobiles: Technologies and Standards, LG Electronics MobileComm," IEEE ICC 2008, Beijing, pp. 67-92 (part 2 of 3).

Wang, Shu, et al, "Location Based Services for Mobiles: Technologies and Standards, LG Electronics MobileComm," IEEE ICC 2008, Beijing, pp. 93-123 (part 3 of 3).

Weckesser, P, et al, "Multiple Sensorprocessing for High-Precision Navigation and Environmental Modeling with a Mobile Robot," IEEE, 1995, pp. 453-458.

Weinberg, Harvey, "MEMSs Motion Sensors Boost Handset Reliability," <<http://www.mwrf.com/Articles/Print.cfm?ArticleID=12740>>, Jun. 2006, 3 pages.

Wixted, Andrew J, et al, "Measurement of Energy Expenditure in Elite Athletes Using MEMS-Based Triaxial Accelerometers," IEEE Sensors Journal, vol. 7, No. 4, Apr. 2007, pp. 481-488.

Wu, Winston H, et al, "Context-Aware Sensing of Physiological Signals," IEEE Int. Conf. on Engineering for Medicine and Biology, Aug. 23-26, 2007, pp. 5271-5275.

Yoo, Chang-Sun, et al, "Low Cost GPS/INS Sensor Fusion System for UAV Navigation," IEEE Digital Avionics Systems Conference (DASC '03), 2003, 9 pages.

"Heart Rate Monitor Sports Bra," <[www.numetrex.com/about/heart-rate-monitor-sports-bra](http://www.numetrex.com/about/heart-rate-monitor-sports-bra)>, Accessed Aug. 9, 2013, 2 pages.

"Smart Underwear With Biosensors Availability in the Market Kudos to Modern Inkjet Printer Technology," <[www.kokeytechnology.com/biotechnology/smart-underwear-with-biosensors-availability-in-the-market-kudos-to-modern-inkjet-printer-technology/](http://www.kokeytechnology.com/biotechnology/smart-underwear-with-biosensors-availability-in-the-market-kudos-to-modern-inkjet-printer-technology/)>, Published Jul. 21, 2010, 2 pages.

Mein Hold, Bridgette, "Adidas by Stella McCartney's Tennis Bra Includes Built-In Heart Sensor," <[www.ecouterre.com/adidas-by-stella-mccartneys-tennis-bra-includes-built-in-heart-sensor/](http://www.ecouterre.com/adidas-by-stella-mccartneys-tennis-bra-includes-built-in-heart-sensor/)>, Mar. 23, 2012, 2 pages.

European Patent Application No. EP09819844.3, Office Action, Dated Oct. 11, 2013, 6 pages.

Japanese Patent Application No. 2011-531156, Notification of Reasons for Rejection, Dispatched Dec. 2, 2013, 6 pages.

European Patent Application No. EP09819844.3, Supplementary European Search Report, Dated Jun. 5, 2012, 10 pages.

\* cited by examiner

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