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| EXAMINER | |
|---|---|
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) |
|---|---|---|
| | 11/977,603 | SONG ET AL. |
| | **Examiner** | **Art Unit** |
| | XIANG ZHANG | 2617 |

***-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --***

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *03 November 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 2, 6, and 7, and 13-16 are ejected under 35 U.S.C. 103(a) as being unpatentable over by Rajesh (WO 02/085061) in view of Larsson (US PGPub 205/0014464 A1) and further in view of Rappaport (US Pat 7676194 B2).

Regarding claim 1, Rajesh discloses a scheduling method of a Base Station (BS) in a cellular system using a wired Relay Station (RS), comprising: collecting Channel Quality Information (CQIs) of all Mobile Stations (MSs) within a cell ([1091]); calculating a transmittable data amount for each of the MSs according to the CQIs ([1092], [1093] wherein the DRC value with quality indication is used to calculate the throughput/transmittable data amount for each user in a total of N users in the cell); and selecting an MS having a highest PF metric and allocating resources to the selected MS, the PF metric being defined as: P F metric for ith M S = R i ( t ) R i ( t ) _ ( 4 ) where i denotes the index of an MS, R.sub.i(t) denotes a data rate available to an i.sup.th MS in a scheduling time period t, and R.sub.i(t) denotes the average data rate of data transmitted to the i.sup.th MS from a previous time period to the scheduling time period t ([1036], also see [1084], also see equation 9 and 10 wherein the MS user i with the highest PF metric value with the ratio of the [available/data rate value represented as the channel condition metric Ai(t)] and the [average data rate of the data transmitted to the ith MS/(Ui(t): and the MS having the highest PF metric being expressed as: i * = arg max [ R i ( t ) R i ( t ) _ ] ( 5 ) where i* denotes the selected MS in the scheduling time period t ([1085], also see equation 24).

However, Rajesh lacks the teaching of collecting by the base station Channel Quality Information (CQIs) of all Mobile Stations (MSs) within a cell of a plurality of cells and the BS receiving CQIs via at least one RS.

In the same field of endeavor, Larsson suggests collecting by the base station Channel Quality Information (CQIs) of all Mobile Stations (MSs) within a cell of a plurality of cells and the BS receiving CQIs via at least one RS ([0037], also see [0040], lines 16-23).

It would have been obvious for one having ordinary skill in the art at the time of the invention to adapt the teaching of collecting by the base station Channel Quality Information (CQIs) of all Mobile Stations (MSs) within a cell of a plurality of cells and the BS receiving CQIs via at least one RS as suggested by Larsson in order to provision the QOS requirement uniformly throughout a scaled network.

However, the combination of Rajesh and Larsson still lacks the explicit teaching of the RS being wired

In the same field of endeavor, Rappaport teaches the RS being wired (claim 8).

It would have been obvious for one having ordinary skill in the art at the time of the invention to adapt the teaching of the RS being wired as taught by Rappaport in order to achieve transmission reliability.

Regarding claim 2, Rajesh disclose the method further comprising: updating R.sub.i(t) when selecting MSs to be scheduled and allocating resources for the scheduling time period t as: R i ( t ) _ = ( 1 - 1 t c ) R i ( t - 1 ) + 1 t c R i ( t - 1 ) for i = i * ([1096] wherein the data rate Ri (t+1) is a convolved version of Ri(t) after time lapse (t-1) when the R is low which results in the ith MS not being serviced since it is not considered the recipient of data transmissions from the base station in the recent past when and ith MS has the highest PF metric, namely, i=i*); R i ( t ) _ = ( 1 - 1 t c ) R i ( t - 1 ) for i .noteq. i * ( 6 ) where t.sub.c is set to a maximum time period for which the i.sup.th MS is not serviced (see equation 15 wherein when the ith MS does not have the highest PF metric, namely, i≠i*, the ith user will not be selected and no data will be transmitted. Therefore, the D becomes zero and the term D*(1/Tc) drops out).

Regarding claim 6, Rajesh discloses an apparatus for scheduling of a Base Station (BS) in a cellular system using a wired Relay Station (RS), comprising: a processor in communication with a memory, the memory storing software instruction which when accessed by the processor causes the processor to execute ([1146], lines 21-29): collecting Channel Quality Information (CQIs) of all Mobile Stations (MSs) within a cell ([1091]); calculating a transmittable data amount for each of the MSs according to the CQIs ([1092], [1093] wherein the DRC value with quality indication is used to calculate the throughput/transmittable data amount for each user in a total of N users in the cell); and selecting an MS having a highest PF metric and allocating resources to the selected MS, the PF metric being defined as: P F metric for ith M S = R i ( t ) R i ( t ) _ ( 4 ) where i denotes the index of an MS,R.sub.i(t) denotes a data rate available to an i.sup.th MS in a scheduling time period t, and R.sub.i(t) denotes the average data rate of data transmitted to the i.sup.th MS from a previous time period to the scheduling time period t ([1036], also see [1084], also see equation 9 and 10 wherein the MS user i with the highest PF metric value with the ratio of the [available/data rate value represented as the channel condition metric Ai(t)] and the [average data rate of the data transmitted to the ith MS/(Ui(t): and the MS having the highest PF metric being expressed as: i * = arg max [ R i ( t ) R i ( t ) _ ] ( 5 ) where i* denotes the selected MS in the scheduling time period t ([1085], also see equation 24).

Regarding claim 7, Rajesh disclose the apparatus wherein the software instruction further causing the process to execute ([1146], lines 3-5): updating R.sub.i(t) when selecting MSs to be scheduled and allocating resources for the scheduling time period t as: R i ( t ) _ = ( 1 - 1 t c ) R i ( t - 1 ) + 1 t c R i ( t - 1 ) for i = i * ([1096] wherein the

data rate Ri (t+1) is a convolved version of Ri(t) after time lapse t-1 when the R is low which results in the ith MS not being serviced since it is not considered the recipient of data transmissions from the base station in the recent past when and ith MS has the highest PF metric, namely, i=i*); R i ( t ) _ = ( 1 - 1 t c ) R i ( t - 1 ) for i .noteq. i * ( 6 ) where t.sub.c is set to a maximum time period for which the i.sup.th MS is not serviced (see equation 15 wherein when the ith MS does not have the highest PF metric, namely, i≠i*, the ith user will not be selected and no data will be transmitted. Therefore, the D becomes zero and the term D*(1/Tc) drops out).

Regarding claim 11, Rajesh further discloses the teaching wherein said mobile stations transmit CQI information in a designated time slot ([1097], and [1126]).

Regarding claims 13, Rajesh further teaches the apparatus wherein said mobile stations transmit CQI information in a designated time slot ([1100], lines 10-13, and [1101], lines 10-11 wherein the weight value is being transmitted to reflect the CQI channel quality grade of service in the slots).

Regarding claims 14-16, Rajesh discloses the method, product and apparatus discussed in claim 1. However, Rajesh lacks the teaching of wherein R.sub.i(t) is calculated based on the Channel Quality Information (CQI) of a previous frame, said CQI represented as average Carrier-to-Interference and Noise Ratio (CINR).

In the same field of endeavor, Kim discloses the teachings of wherein R.sub.i(t) is calculated based on the Channel Quality Information (CQI) of every frame, said CQI represented as average Carrier-to-Interference and Noise Ratio (CINR) ([0031]).

One of ordinary skill in the art at the time of the invention would have recognized to modify the teaching of wherein R.sub.i(t) is calculated based on the Channel Quality Information (CQI) of a previous frame, said CQI represented as average Carrier-to-Interference and Noise Ratio (CINR) as taught by Kim in order to reflect the transmittable data quantity and channel quality through the interference level.

3. Claims 3-5, 8-10, and 12 are ejected under 35 U.S.C. 103(a) as being unpatentable over by Rajesh (WO 02/085061) in view of Larsson (US PGPub 205/0014464 A1) and further in view of Rappaport (US Pat 7676194 B2) and further in view of Kim (US PGPub 2007/0081491 A1).

Regarding claim 3, Rajesh in view of Larsson and further in view of Rappaport discloses the method discussed in claim 1. However, the combination of Rajesh, Larsson and Rappaport lacks the teaching further comprising: dynamically dividing a frame by counting the number of resources allocated to a frame of each node being the BS or an RS.

In the same field of endeavor, Kim discloses the teaching further comprising: dynamically dividing a frame by counting the number of resources allocated to a frame of each node being the BS or an RS ([0029], [0030]).

It would have been obvious for one having ordinary skill in the art at the time of the invention to adapt the teaching further comprising: dynamically dividing a frame by counting the number of resources allocated to a frame of each node being the BS or an RS as taught by Kim in order to effectively multiplex the packets while assigning the number of channel resources utilizing the sector reuse scheme.

Regarding claim 4, Rajesh in view of Larsson and further in view of Rappaport and further in view of Kim teaches the method discussed in claim 3. Rajesh further teaches the method of determining boundaries among frame segments according to the sizes of the allocated resources if the sum is equal to the total number of resources per transmission frame ([1101] wherein the reference threshold for comparing the queue weight dictates the boundaries among the predetermining sized frame segments fitting into the time slots for the selected user if the sum/selected queue is equal to the total number of resources per transmission frame/current queue weight).

However, the combination of Rajesh, Larsson, and Rappaport lacks the teaching of wherein the dynamic frame division comprises: detecting one node having the most allocated resources for a current scheduling time period from each reuse group; comparing the sum of resources allocated to detected nodes with the total number of resources per transmission frame.

In the same field of endeavor, Kim discloses the teaching of wherein the dynamic frame division comprises: detecting one node having the most allocated resources for a current scheduling time period from each reuse group ([0014], [0030]); comparing the sum of resources allocated ([0011]) to detected nodes with the total number of resources per transmission frame ([0015], and [0029] wherein the total number of requests from the detected nodes/users coincides with the number of assigning channel resources).

It would have been obvious for one having ordinary skill in the art at the time of the invention to incorporate the teachings of wherein the dynamic frame division comprises: detecting one node having the most allocated resources for a current scheduling time period from each reuse group; comparing the sum of resources allocated to detected nodes with the total number of resources per transmission frame as taught by Kim in order to proceed with the priority queuing algorithm.

Regarding claim 5, Rajesh in view of Larsson and further in view of Rappaport discloses the method discussed in claim 1. However, the combination of Rajesh, Larsson, and Rappaport lacks the teaching further comprising: dividing two-dimensional time and frequency resources of the frame.

In the same field of endeavor, Kim discloses the method further comprising: dividing two-dimensional time and frequency resources of the frame ([0007]).

It would have been obvious for one having ordinary skill in the art at the time of the invention to utilize the teaching further comprising: dividing two-dimensional time and frequency resources of the frame as taught by Kim in order to comply with the discrete time Fourier Transformation during the signal encoding and decoding process.

Regarding claim 8, Rajesh in view of Larsson and further in view of Rappaport disclose the apparatus as discussed in claim 6. However, the combination of Rajesh, Larsson and Rappaport lacks the teaching of wherein the software instruction further causing the process to execute: dynamically dividing a frame by counting the number of resources allocated to a frame of each node being the BS or an RS.

In the same field of endeavor, Kim discloses the teaching further comprising: dynamically dividing a frame by counting the number of resources allocated to a frame of each node being the BS or an RS ([0029], [0030]).

It would have been obvious for one having ordinary skill in the art at the time of the invention to adapt the teaching further comprising: dynamically dividing a frame by counting the number of resources allocated to a frame of each node being the BS or an RS as taught by Kim in order to effectively multiplex the packets while assigning the number of channel resources utilizing the sector reuse scheme.

Regarding claim 9, Rajesh in view of Larsson and further in view of Rappaport and further in view of Kim teaches the apparatus discussed in claim 8. Rajesh further teaches the apparatus wherein the dynamic frame division comprises: determining boundaries among frame segments according to the sizes of the allocated resources if the sum is equal to the total number of resources per transmission frame ([1101] wherein the reference threshold for comparing the queue weight dictates the boundaries among the predetermining sized frame segments fitting into the time slots for the selected user if the sum/selected queue is equal to the total number of resources per transmission frame/current queue weight).

However, the combination of Rajesh, Larsson, and Rappaport lacks the teaching of wherein the dynamic frame division comprises: detecting one node having the most allocated resources for a current scheduling time period from each reuse group;

comparing the sum of resources allocated to detected nodes with the total number of resources per transmission frame.

In the same field of endeavor, Kim discloses the teaching of wherein the dynamic frame division comprises: detecting one node having the most allocated resources for a current scheduling time period from each reuse group ([0014], [0030]); comparing the sum of resources allocated ([0011]) to detected nodes with the total number of resources per transmission frame ([0015], and [0029] wherein the total number of requests from the detected nodes/users coincides with the number of assigning channel resources).

Regarding claim 10, Rajesh in view of Larsson and further in view of Rappaport discloses the apparatus discussed in claim 6. However, the combination of Rajesh, Larsson, and Rappaport lacks the teaching of the dynamic frame division comprises: dividing two-dimensional time and frequency resources of the frame.

In the same field of endeavor, Kim discloses the apparatus further comprising: dividing two-dimensional time and frequency resources of the frame ([0007]).

It would have been obvious for one having ordinary skill in the art at the time of the invention to utilize the teaching further comprising: dividing two-dimensional time and frequency resources of the frame as taught by Kim in order to comply with the discrete time Fourier Transformation during the signal encoding and decoding process.

Regarding claims 12, Rajesh further teaches the computer product wherein said mobile stations transmit CQI information in a designated time slot ([1100], lines 10-13, and [1101], lines 10-11 wherein the weight value is being transmitted to reflect the CQI channel quality grade of service in the slots).

***Response to Arguments***

3. Applicant's arguments with respect to claims 1-12 have been considered but are moot in view of the new ground(s) of rejection.

On page 10, [0003] of the applicants' remark, the applicants argue that Rajesh and Kim does not teach dynamic division of a frame. However, this limitation is not included in claim 6.

***Conclusion***

4. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Charles Appiah can be reached on (571)272-7904. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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